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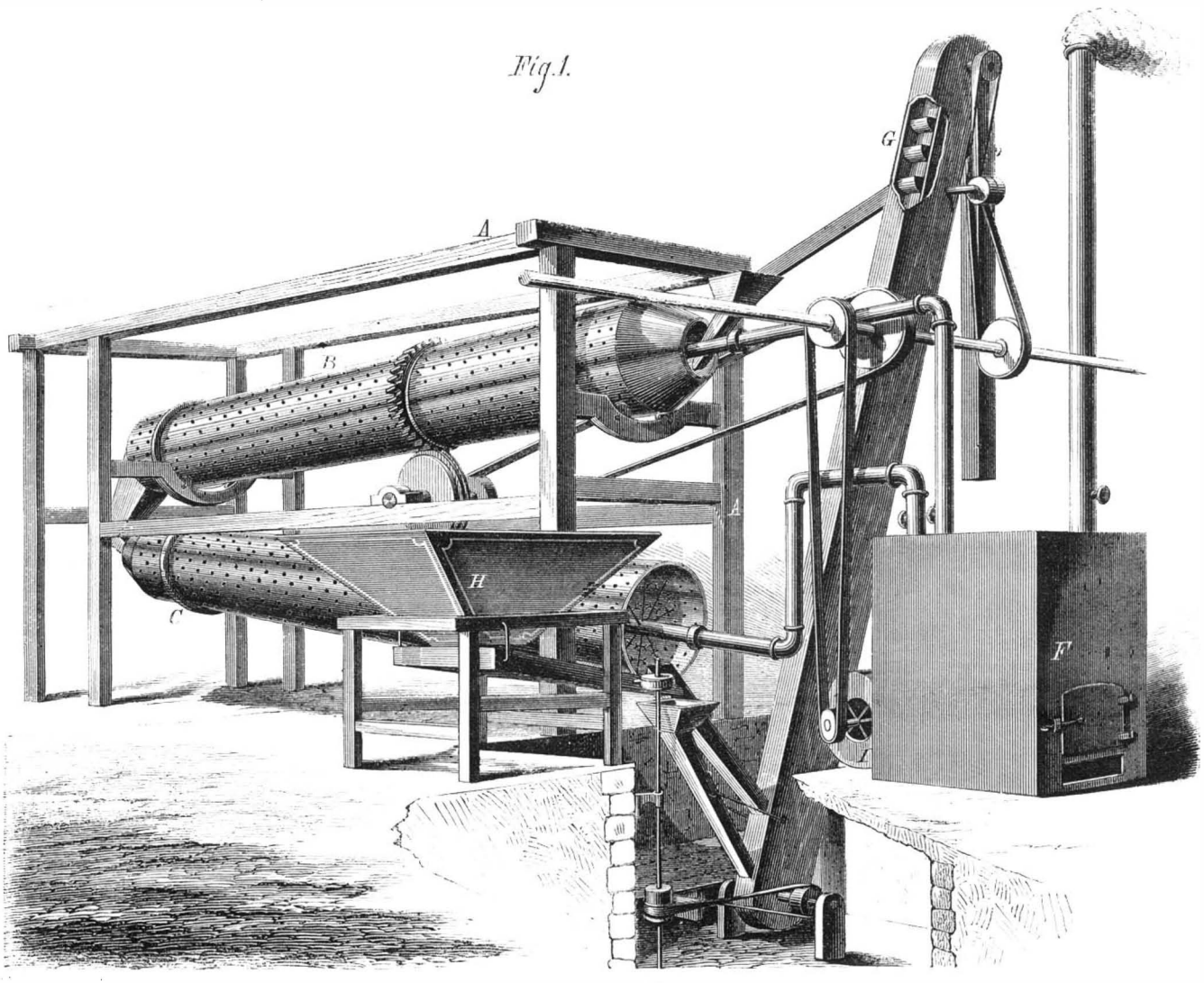
Improved Coffee and Grain Dryer.

We this week illustrate a new machine, invented by José Guardiola, of Chocolá, Guatemala, Central America, for artificially drying grain, coffee, malt, etc., so as to prepare it for preservation, transportation, or other purposes. It is more particularly intended to supersede the common method of drying such articles by exposure to the sun, by materially hastening the evaporation of the surplus moisture. It consists of a new arrangement of cylinders, hot air tubes, etc., for drying the grain, and a new construction of furnace for heating the air.

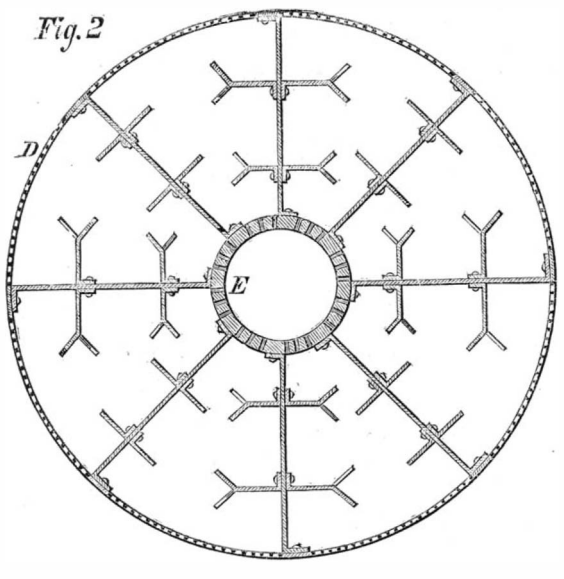
In Fig. 1, A shows the frame of the machine, which serves as a support for two inclined perforated cylinders, B and C. The cylinder, B, is so placed that its lower end is above the upper end of the cylinder, C, and they are there connected by a fixed neck or conduit, as seen in the engraving. The cylinders are supported on small rollers having their supports in the frame, by which means they can be readily revolved around their axes. Rotary motion is imparted to them by a worm gear working in toothed wheels attached to them, one of which is shown at B. Each cylinder contains an inner perforated tube, which is shown in section in Fig. 2, where D is the outer shell of the cylinder and E the contained tube. It will be seen that, between the inner tube and outer shell, there are radial partitions dividing the cylinder into segmental compartments. From these partitions, transverse plates project into the compartments and carry, at some of their ends, wings which are turned alternately inward and outward, as shown in the figure. The partitions and their appendages extend the whole length of the cylinders. The inner tubes of the two cylinders are coupled so that they remain free to revolve with the two hot air flues which project from the heater, F, as shown in Fig. 1. G is an elevator for raising the grain to be dried to the requisite hight; it has one spout extending from the upper part into the open end of the cylinder, B, and another leading downward to a suitable receptacle for the grain. A valve is arranged so as to open whichever spout is to be used, and to shut off the other. From the lower part of the cylinder, C, a spout leads into the lower part of the elevator. H is a hopper, from which the grain is fed into a vibrating shoe, which empties into a spout leading to the elevator. The heating apparatus, F, has a fire chamber, in which a tubular grate and additional vertical tubes connect the hot air chamber with a cold air supply chamber underneath. The fan, I, supplies the cold air to the supply chamber, whence it passes through the tubes and reaches the hot air chamber, thoroughly heated.

Fig. 1.



GUARDIOLA'S COFFEE AND GRAIN DRYER

Fig. 2



The operation of the machine is as follows: The grain to be dried is conveyed from the hopper over the vibratory shoe to the lower part of the elevator, and thence to the upper end of the cylinder, B. Within this cylinder, it is distributed through the compartments and gradually conveyed to the lower end, from which it passes through the stationary neck into the cylinder, C, where it is again agitated and moved along, while within the cylinders the grain is constantly subjected to the action of the heated air which passes from the perforations in the contained tubes into all the compartments and out through the outer shells. If, after having passed through the cylinder, C, the grain should not be dry enough, it may be reconveyed to the elevator and passed again through the machine, and this may be repeated as often as is necessary. When the required degree of dryness is obtained, the grain is finally discharged through the proper spout into a receptacle provided for it. The cylinders may be revolved five or more times in a minute, or slower, according to the requirements of the case. The temperature in the cylinders is ascertained by a thermometer, and regulated by the quantity of fuel supplied to, and the use of dampers in, the heating apparatus. The complicated motions, given to the grain by the partitions, plates, and wings, cause it to travel a distance of about three miles in an hour, and the evaporation goes on rapidly. Coffee, which contains fifty per cent of water, takes from eight to ten days to dry in the sun; it dries in less than twenty-four hours in this machine. Grain would dry in one or two passages through the cylinders.

Mr. Guardiola is an extensive coffee grower, and has invented other machines of great practical value in curing coffee and like products of Central America. We have been favored with a generous sample of coffee from the Chocolá plantation, worked by Mr. Guardiola, and can personally testify to the plumpness of the berry and its fine flavor when cooked.

We notice elsewhere a coffee huller invented by this gentleman, and we shall present engravings and descriptions of other inventions pertaining to the same industry, from the same source, in future issues.

The invention was patented through the Scientific American Patent Agency, May 7, 1872. For further information Mr. Guardiola may be addressed, care of Ribon & Muñoz, 63 Pine street, New York, or care J. C. Merrill & Co., 204 California street, San Francisco, Cal.

Solvent for Coralline.

The solubility of coralline in an alkaline liquid suggested the propriety of employing soluble glass (basic silicate of soda) which has necessarily always an alkaline reaction, and by the use of which there might be expected to result a compound sparingly soluble in water. The experiment proved successful. Larger or smaller quantities of coralline were dissolved in a boiling solution of one part of soluble glass of a sirupy consistence, previously diluted with four parts of water. Thus were obtained solutions which gave stains ranging from the most delicate rose to the most brilliant carmine. They are well suited for dyeing light colored woods containing but a small amount of tannin, such as Scotch fir, pine, lime, willow, etc. These, without injury to the color, may be subsequently varnished and polished. The same process may be applied to paper intended for the manufacture of artificial flowers, and for a variety of ornamental purposes. These solutions can only be preserved one or two days in a state fit for use. If allowed to stand longer, the silica separates itself out from the soluble glass, the solution gelatinizes, and the color loses its solidity and fire. The tar colors, known in commerce as poncean, soluble in cold water and solutions of soluble glass, form beautiful red liquids, like that yielded by coralline. These, even after long standing, do not deposit their silica, and can therefore serve to prepare a brilliant red ink. Aniline yellow and vesuvine, on the other hand, are less soluble in soluble glass than in water.

GUARDIOLA'S PESTLE FOR HULLING COFFEE, RICE, ETC.

Our engraving shows a novel form of pestle to be used in hulling rice, coffee, etc., either by hand or machinery. It is

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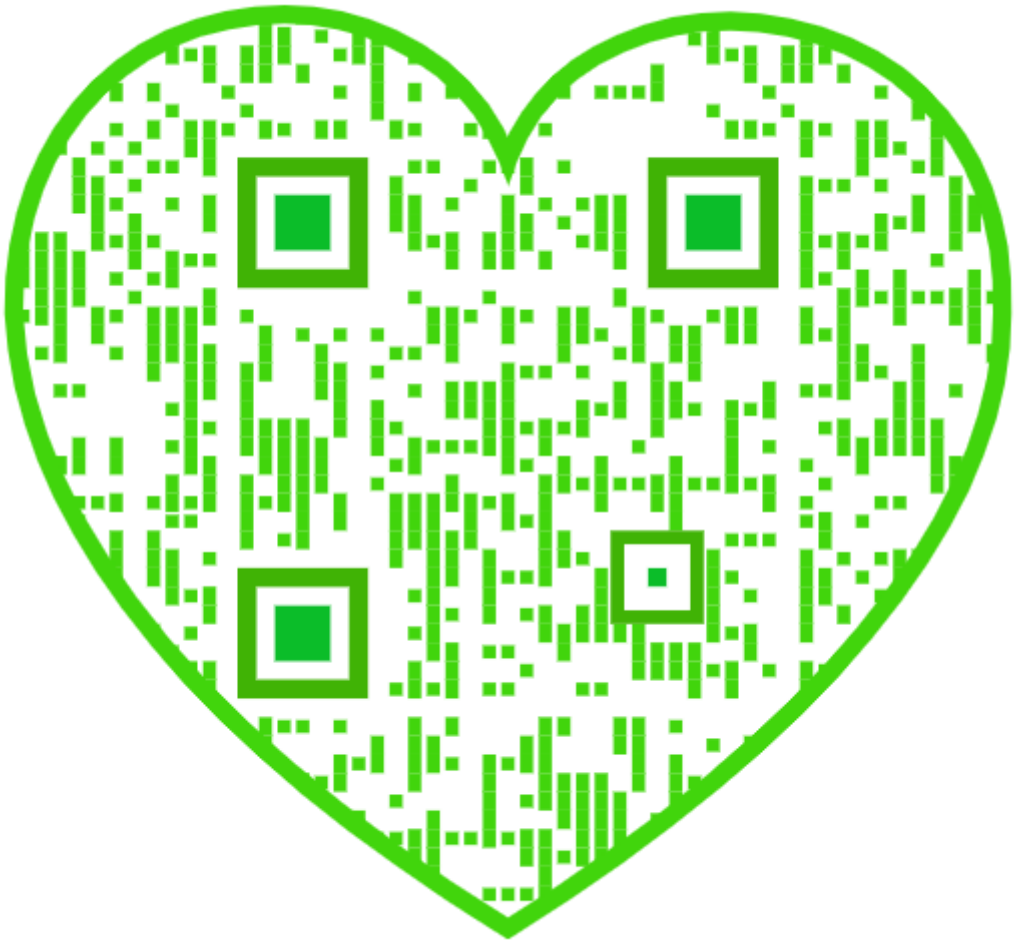

the invention of José Guardiola. of Chocolá, Guatemala, and was patented by him through the Scientific American Patent Agency, April 30, 1872.

The invention consists in making the pestle, which is conical in form, with projecting ribs of various lengths, thereby forming grooves, in which the grains work their way upward by friction, and are thus divested of the external husks of pellicles it is desired to remove.

The pestle is operated by moving it up and down in the mass of grains to be hulled. The grains are thus crowded into and through the grooves, which, it is claimed, acts effectively to speedily accomplish the hulling.

FROM THE ATLANTIC TO THE PACIFIC.

A recent number of *Harper's Magazine* contains the following interesting description of the cars used on the Pacific Railway:

"From Chicago to Omaha, your train will carry a dining car, which is a great curiosity in its way. I expected to find this somewhat greasy, a little untidy, and with a smell of the kitchen. It might, we travellers thought, be a convenience, but it could not be a luxury. But in fact it is as neat, as nicely fitted, as trim and cleanly, as though Delmonico had furnished it; and though the kitchen may be in the forward end of the car, so perfect is the ventilation that there is not even the faintest odor of cooking. You sit at little tables which comfortably accommodate four persons; you order your breakfast, dinner, or supper from the bill of fare which, as you will see below, contains a quite surprising number of dishes, and you eat, from snow white linen and neat dishes, admirably cooked food, and pay a moderate price.

"Beyond Omaha, unless you have taken seats in a hotel car, you eat at stations placed at proper distances apart, where abundant provision is made, and the food is, for the most part, both well cooked and well served. These hotel stations are under the supervision and control of the managers of the roads, and at many of them, especially on the Central Pacific road—in California, that is to say—your meals are served with actual elegance. Sufficient time is allowed—from thirty to thirty-five minutes—to eat; the conductor tells you beforehand that a bell will be rung before the train starts, and we always found him obliging enough to look in and tell the ladies to take their time, as he would not leave them.

"There is a pleasant spice of variety and adventure in getting out by the way side at the eating stations. We saw strange faces, we had time to look about us, the occasional Indian delighted the children, we stretched our legs and saw something of our fellow passengers in the other cars. Moreover, if you have a numerous party desirous to eat together, the porter will telegraph ahead for you to have a sufficient number of seats reserved; and thus you take your places without flurry or haste, and do not have your digestion spoiled by preliminary and vexatious thoughts about pushing for a good place. In short, these trains are managed for the pleasure and accommodation of the passengers. The voyage would, I suppose, be unendurable else.

"The sleeping car, but for which the journey to the Pacific by rail would be extremely uncomfortable, but by whose help it is made a pleasure trip, owes its development and perfection to Mr. George M. Pullman, who is the inventor and patentee of most of the ingenious devices by which the traveler's comfort is secured in these cars. Of course he is an American. He began life poor, was once a miner in Colorado, and was, I believe, so poor when he began the experiment of his sleeping cars that it was with great difficulty he raised the means to build his first car. He is now president of the Pullman car company, which has five hundred sleeping, drawing room and hotel cars on different railroads, and is building more, at the rate of three finished cars for every week of the present year. The company is also building a new kind of day cars, to be put on such short routes as that between New York and Washington; and by the time you are reading this, it will run a daily hotel car from Chicago to Ogden, in which you may sit and sleep, and have your meals served at any time you may choose to order them. It is planning, and will fit up this year near Chicago, extensive car works of its own on grounds large enough to contain also the cottages of the thousand workmen who will be there employed; and it is said that these grounds are to be planned with special regard to the convenience of the men and their families. The company has already found it expedient to keep and furnish, near the depots in all the great cities, rooms where conductors or porters may, at the end of a journey, bathe, change their clothes, make out their reports, and read, write, and amuse themselves. Mr. Pullman thinks that, as he requires much from his men, and as they are picked men, trained with care, it is an advantage to the company to furnish them such a home at the ends of the routes of travel, where they make themselves comfortable and at ease. Certainly it is a humane thought and likely, besides, to give him the command of responsible servants.

"The Pullman cars are constantly improving. The Russian Grand Duke traveled last winter in perhaps the most commodious and perfect manner in which any one ever traveled by rail. He had in one train a day car, in which he and his companions could sit at ease, read, write, or amuse themselves as in a parlor; a dining or hotel car, into which they passed to breakfast or dinner; and a sleeping car. No doubt the impressions he got of this kind of pleasure traveling will facilitate Mr. Pullman's entrance into Russia, where, as well as in England, Germany, and France, the Pullman company will within two years have placed their cars, as arrangements are now making for that purpose.

"The superiority of the American sleeping cars is in their cleanliness, the perfection of their heating and ventilating contrivances, and the presence of everything which can make a car convenient to live in. There is nothing like them in Europe, and all European travelers in this country have been surprised and delighted with them. The Pullman company is successful, as it deserves to be. It now runs cars on nearly one hundred roads, the railroad companies generally owning one half the stock of the cars they use, and thus having a mutual interest. The Pullman company sells to the public what the railroad company in such cases does not furnish—the sleeping car accommodations. You may now ride in Pullman cars over sixty thousand miles of railroad. The Pullman company already employs over two thousand persons, and in its new car shops will employ one thousand more; and all this vast business has grown from the smallest beginnings.

"One of the pleasantest ways to travel across the continent, though not, I think, the way in which you will see most of the people, is to make the journey with a party of friends numerous enough to fill or nearly fill, a car. To show you at what cost—exclusive of the regular railroad fare—such a company may journey, I give you here some extracts from a little book issued, for the information of travelers, by the company:

"For a regular sleeping car, containing twelve open sections of two double berths each, and two state rooms of two double berths each, (in all twenty-eight berths,) with conductor and porter, seventy-five dollars per day.

"For a drawing room car, containing two drawing rooms having each a sofa and two large easy chairs by day, and making up at night into two double and two single berths, three state rooms having each two double berths, and six open sections of two double berths each, (in all twenty-six berths) with conductor and porter, seventy-five dollars per day.

"For a hotel car, containing two drawing rooms, as above described, one state room, having two double berths, and six open sections of two double berths each, (in all twenty-two berths, (and having also, in one end, a kitchen fully equipped with everything necessary for cooking and serving meals, with conductor, cook, and two waiters, eighty-five dollars per day.

"The Pullman hotel car is one of the most ingenious, as well as the most convenient, of modern arrangements for travel. It can seat forty persons at the tables; it contains not only a kitchen—which is a marvel of compactness, having a sink, with hot and cold water faucets, and every 'modern convenience'—but a wine closet, a china closet, a linen closet, and provision lockers so spacious as to contain supplies for thirty people all the way from Chicago to the Pacific, if necessary; its commissary list contains, as I ascertained by actual count, 133 different articles of food; it carries 1,000 napkins, 150 table cloths, 300 hand towels, and 30 or 40 roller towels, besides sheets, pillow cases, etc., etc. And unless you are of an investigating turn, you would never know that the car contained even a kitchen.

"Whenever a sleeping car arrives at the end of a journey, it is laid over for twenty-four hours. Thereupon the porter gathers up the soiled linen for the laundry, and a force of men and women enter the car and take out of it bedding, carpets, and every movable thing; all are beaten with rods and hung up to air; and meantime the whole car is aired, and the woodwork dusted, rubbed, and scrubbed in the most thorough manner. This is the manner of their housekeeping."

The Hartford Steam Boiler Inspection and Insurance Company.

The Hartford Steam Boiler Inspection and Insurance Company makes the following report of its inspections in the month of April, 1872:

During the month, 823 visits of inspection were made, and 1,652 boilers examined—1,605 externally, and 563 internally—198 were tested by hydraulic pressure. Most of these latter were new boilers, in the yards of boiler makers, which we were called to examine previously to their being put in use. Number of defects in all discovered, 1,264, of which 286 were regarded as dangerous. Many of these boilers were in iron works, furnaces, and rolling mills, and were operated by the waste heat, which is often very severe in its effects on boilers. Furnaces out of shape, 51—3 dangerous; fractures in all, 164—65 dangerous. These cases were found mostly in boilers that had been used for some years and overworked, or in those which had accumulated quantities of deposit, and which were badly scaled. Burned plates, 82—29 dangerous; blistered plates, 137—21 dangerous; cases of sediment and deposit, 166—28 dangerous; cases of incrustation and scale, 200—27 dangerous; cases of external corrosion, 79—25 dangerous; cases of internal corrosion, 36—5 dangerous. Internal corrosion is usually the result of impure feed water. Water in and about chemical works is very bad indeed, and such boilers should be fed from streams or pools having no connection whatever with the works. We have of late been obliged to condemn the boilers of a large manufactory of this kind, because, upon examination, they were found in a very dangerously corroded condition. When the feed water for boilers cannot be obtained from sources that are pure, that is, free from acids, carbonate of soda has been found beneficial, and is used quite extensively in England. Cases of internal grooving, 47—10 dangerous; water gages out of order, 40—6 dangerous; blow out apparatus defective, 30—5 dangerous. One great trouble with this last fitting is that it is often partly imbedded in brickwork; the valves and connections are poor or defective, and the result is they leak, and the water in the boiler is found to be low, when the real cause is not understood. Hence the pipes which connect blow out cocks to the boilers should be easily accessible, and in no case should they be imbedded in masonry. Safety valves overloaded and defective, 31—23 dangerous; boilers without gages, 10—7 dangerous; pressure gages defective, 76—17 dangerous, varying from — 10 to + 7. Cases of deficiency of water, 7—2 dangerous; broken braces and stays, 44—15 dangerous; boilers condemned, 13.

Artists with Bad Eyes.

Rarely, perhaps never, has the skill of the surgeon been demonstrated in such an interesting manner as in the recent artistic researches of Mr. Liebreich. This eminent ophthalmist has lately been lecturing at the Royal and London Institutions on the effect of certain faults of vision on painting, with especial reference to the works of Turner and Mulready. His lectures have excited much interest, especially among artists and art patrons. And his lucid, carefully elaborated demonstrations, which he enforces with almost mathematical precision, lead the great majority of his hearers to the conclusions which he has formed. Mr. Liebreich truly says that many connoisseurs elevate the faults in Turner's paintings into peculiarities of style, and some would even go so far as to form a school to imitate that style. Turner's earlier paintings were not disfigured with the haziness and falsity of proportion which marked his later productions; and these faults the lecturer exactly reproduced to his audience by throwing a landscape or a tree on the screen, and then by interrupting the rays between the picture and the reflection by a lens so constructed as to diverge them to such extent as, according to this theory, they were diverged in the case of Turner. Turner's defect of vision was what is known as "astigmatism," that is, the vertical rays and the horizontal rays of light were not brought to his sight at exactly the same focus. Hence arose the vagueness and incorrect proportions we have referred to. Turner painted from Nature exactly as Nature appeared to him, but not as it appeared to him when his sight was truthful. Mulready's defect was a yellowness in the crystaline lens of the eye, which came on with age, and which occasioned a comparative failure of perception of blue colors. The result was that the artist added his blue tints much too extravagantly, and presented ploughboys in smock frocks as though they had been clothed in purple. Mr. Liebreich's opinions are endorsed by many of the ablest scientific and artistic authorities, and, as we said, seem to be conclusively established by his arguments.—*Chemist and Druggist.*

Expeditions to the North Pole.

According to advices from Stockholm, the projected north polar expedition, under the control of Professor Nordenskiold, is almost ready for sea, and Swedish geographers entertain great hopes of success for the new undertaking. The expedition will have on board, besides Professor Nordenskiold, Lieutenant Palander, of the Swedish navy, who has already had some experience in polar exploration, having accompanied the Swedish expedition of 1868; also a physician, a physicist, and several other servants, who will accompany the expedition for the summer, returning from Spitzbergen in the autumn; making in all, with the crew, twenty persons. The principal object of the expedition, which is not expected to return before the summer or autumn of 1873, is to reach the pole from high latitudes by means of sleighs drawn by reindeer—an enterprise in which the German geographer, Dr. Petermann, of Gotha, does not place much faith. The expedition will take with it from Gothenburg a portable house, of nine rooms and kitchen, which is to be put up on the Seven Islands, in 80° 38″ northern latitude—the most northern point at which an expedition has ever wintered in these regions. Great importance appears to be attached by Professor Nordenskiold to the cargo of fifty reindeer, which he will ship from Norway, together with the necessary fodder and a number of Lapps to attend them.

Dr. Petermann and the great majority of the German geographical societies have given their entire support to the new Austrian expedition, which is to sail from Bremerhaven about the end of June, and which Dr. Petermann greets as "the greatest event in the history of modern arctic explorations." The object of the Austrian expedition will be the farther navigation of the ice-free ocean which they met with last summer to the east and north, and the exploration of the arctic ocean to the north of Siberia. The plan of the voyage is as follows: The expedition being provisioned for a period of three years, the first winter is to be spent on Cape Tschelinskin, the most northern promontory of Asia; during the second summer the exploration of the central polar ocean is to be continued, and an effort made to reach the pole; the second winter will be spent on the new Siberian island, and the third summer will be employed in reaching Behring's Straits and an Asiatic or American haven. The Austrian expeditionary vessel is a three masted schooner, 118 feet long, 25½ broad, 13½ deep, provided with an effective engine of 95 horse power, and coals for forty days.

A TABLESPOONFUL of quicksilver was lately found in an old grave in York county, Pennsylvania. It is supposed to have been buried there in the shape of calomel within the patient. —*Exch.*—[In old times, the doctors sometimes administered pure mercury as a medicine; a more common form of mercurial administration was the blue mass. Either of these prescriptions would account for the presence of quicksilver; but dosing with calomel would not.—EDS.]

BY a single blast of nitro-glycerin, at the Hoosac tunnel, North Adams, Mass., the rock was blown out in the center of heading to a depth of eight feet ten inches.

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Nature of the Action in Galvanic Batteries.

Professor G. W. Hough, Director of the Dudley Observatory at Albany, N. Y., has made a series of experiments on galvanic batteries, extending over several months, for the purpose of investigating the cause of the decline in the strength of the electric current after the battery has been in operation a long period. It is well known that, since the invention of the American method of recording transits, the galvanic battery has become one of the necessary instruments in every first class observatory. The application of electricity also to the registration of meteorological phenomena makes it desirable to secure the best form of battery, as well as to be able to know what is the difficulty when the battery begins to fail in its work. Some of the leading conclusions reached by Professor Hough were as follows:

1st. In the sulphate of copper battery (Daniell's form) the principal cause of decline in the strength of the electric current is due to the formation of sulphate of zinc.

2d. The quantity of electricity flowing in the external circuit depends upon the specific gravity of the sulphate of zinc.

3d. When the sulphate of zinc approaches saturation, polarization takes place in the battery itself; and, although the electromotive force remains the same, the internal resistance may be increased more than a hundred times.

4th. The sulphate of zinc (or any fluid about the zinc) is only useful as a conductor of electricity.

5th. The copper, or negative metal, is useful only as a conductor, since it may be replaced by any other metal, even zinc itself.

6th. The internal resistance of the battery has been separated into two parts, namely, that due to the porous cell and that due to the liquids employed. The specific resistance of the liquid was found to be 13; that for a small clay cell, 17, and for a leather cell, 7. Since the resistance of the leather cell is less than one half that of a clay cell, it has been used in the construction of batteries at the observatory, as the quantity of electricity is nearly doubled without any increase of surface. For the negative metal, in place of the copper hitherto employed, we have used sheet lead.

These investigations have rendered it possible to compute, with great precision, the length of time a battery will generate its normal quantity of electricity, provided the amount of electricity flowing in the external circuit is known, and the capacity of the vessel holding the sulphate of zinc is determined. The specific gravity of the sulphate of zinc should not be less than 15° or more than 38° degrees of Baumé.

A new mechanism for the more thorough investigation of galvanic batteries has been devised by Professor Hough, but not yet constructed, by which the quantity of electricity flowing in the external circuit will be recorded in the form of a curve so long as the battery is in action. This subject is one of great interest and importance, and it is proposed by Professor Hough to continue his investigation as circumstances may permit.

Swiss School of Milk Production and Management.

The Swiss Mountain Union, which has for many years been interested in the milk business, has issued a circular in which it claims that milk production and the care of the mountain pastures are the inseparable factors of the nation's wealth. The only article of export is cheese, which was exported in 1868 to the value of 18,674,832 francs, and in 1869, to 21,453,796 francs. The increase of milk products in other parts of the world is alluded to. American factory cheese, an imitation of the English Cheshire, is rivaling its prototype in its home market. Sweden and Denmark have established extensive dairies, while Holland, which controls the cheese trade of the world, has established at Utrecht a perpetual exhibition of dairy utensils, etc., for the instruction of dairymen. The Austrian minister of Agriculture has given two annual prizes for the benefit of cheese factory associations, while in Vorarlburg, Tyrol, Bavaria, Italy, and Prussia, the latest facts, principles, and improvements are disseminated by means of itinerant lecturers, fairs, exhibitions, and publications. It is proposed in Switzerland to adopt this policy in the organization of a school of theoretical and practical instruction in milk production and management. For this purpose, funds are to be raised from the cantons, agricultural societies, and individuals. Great results are anticipated from this enterprise.

Mesquite Gum.

Mr. F. Kalteyer, treasurer of the Agricultural and Industrial Association of Western Texas, says the mesquite gum of that region is almost identical with gum arabic, having been in use there for medicinal and technical purposes, especially in the preparation of mucilage, gum drops, jujube paste, etc. The past year it has become an article of export, some 12,000 pounds having been gathered in Bexar county, and as much more between that and the coast. No gum is gathered west of Bexar, though the drought was favorable to a large crop. This gum is hardly known east of the Brazos. It exudes from the stem and branches of a *mimosa*, several species of which grow in Texas, New Mexico, and Arizona. One of these species, *Algarobia glandulosa* (Torrey and Gray, N. A. F., 399), is rarely met with below the mountain region of western Texas. The species most common in Bexar county grows from twenty to forty feet high and eighteen inches thick. From it, charcoal is manufactured. It is generally used for picket poles, being very durable. It is also made into handsome furniture, the grain being very fine. It grows where no other fruit tree would live. It was favorably noticed in the last annual report of the American Pharmaceutical Association.

The Air We Breathe.

Dr. Angus Smith has gathered together and published the results of his investigations into air and rain, and those of the experiments made to determine their relative purity or impurity in various parts of the British Isles and on the Continent.

Numerous observers have experimented on the air and calculated the amount of oxygen it contains, and although formerly results differed, owing probably to defects in the *modus operandi*, latterly the analyses have come much nearer to agreement and minute accuracy. Gay Lussac and Humboldt gave the mean as 21·0 volumes per cent of oxygen. Cavendish, by making a series of 500 analyses, arrived at the conclusion that 20·833 was the mean amount, and later experiments have shown that he was not far out, Graham and Liebig both giving 20·9. Dr. Angus Smith found, from repeated analyses, the following percentage, which we extract from his table as characteristic situations:—

On the N. E. shore and heaths of Scotland	20·999
Outer circle of Manchester (not raining)	20·947
Open places, London, summer	20·950
In a sitting room, which felt close, but not excessively	20·890
In a small room with petroleum lamp	20·840
Theatre gallery, 10·30 p. m.	20·860
Theatre pit, 11·30 p. m.	20·740
Backs of houses, and about closets	20·700
Court of Queen's Bench	20·650
Under shafts of metal mines (average of many)	20·424
When candles go out	18·500
Worst specimen found in a mine	18·270
Difficult to remain in	17·20

The cursory reader who does not stop to examine what these figures really mean will probably exclaim: What difference capable of affecting health can there be in the air of London and that of Scotland—20·999 against 20·950 per cent of oxygen? It is quite true that a mere deficiency of oxygen to the extent of 49-1,000ths may affect us but little, but that deficiency means something more than a mere absence to that extent of oxygen; it involves a question as to what has taken its place. Even so slight a difference as that between 20·999 and 20·980 is equal to 190 in a million, and if we put impurity into water at this rate, it amounts to 13·3 grains in a gallon. This amount, says Dr. Smith, would be considered enormous if it consisted of putrefying matter, or any organic matter usually found in waters. But we drink only a comparatively small quantity of water, and the whole 13 grains would not be swallowed in a day, whereas we take into our lungs from 1,000 to 2,000 gallons of air daily. We must remember, too, that the blood receives the air and such impurities as are not filtered out in its passage, whereas the stomach has powers of disinfection and destruction which render harmless many organic impurities contained in water. But if we take the air found in the pit of the theater, we find that the difference amounts to 2,590 in a million, and the importance of the minute analysis becomes evident.

In the course of his experiments, Dr. Smith constructed a leaden chamber in which the experimenter could shut himself up from the external air. This chamber contained 170 cubic feet of air when furnished with a table and chair, and occupied by one person. On a day when the temperature was 45°F. no difference in the air breathed was perceptible for 25 minutes; but when drawn from the top by moving an umbrella up and down, it seemed like a soft wind capable of producing a slightly pleasant feeling, being, however, utterly without the property of producing that cheering and exhilarating effect to which we are accustomed in a gentle breeze. The air was moist, and a specimen of it deposited water. After an hour, the well known organic smell noticed in a crowded school room was perceptible on moving about rapidly, and at the end of the experiment, which lasted 100 minutes, had an unpleasant flavor and strength, and persons who entered immediately the door was opened pronounced it very bad. Still, Dr. Smith says he did not feel uncomfortable, although the percentage of oxygen must have been reduced below the average found in the ordinary circumstances of daily life, showing the seductive and insidious character of breathed air. After a stay of 2 hours 20 minutes in the chamber, however, long inspirations became more frequent, and the air was found much less agreeable when breathed at the upper part by standing on a chair; at the end of three hours, the amount of oxygen was reduced to 19·61. In an experiment with burning candles, it was found that the amount of light was sensibly diminished, and when the candles went out, the percentage of oxygen was found to be 18·80*, and of carbonic acid 2·28. On entering the chamber with candles and a spirit lamp, the lights were speedily extinguished, and it was found impossible to rekindle them with matches, the ordinary wooden ones refusing to ignite. Still, it was possible to breathe without difficulty, although a feeling of discomfort was soon experienced. Afterwards gas was lit and burnt brilliantly; but on entering with candles after the gas had gone out, they were instantly extinguished. Nevertheless, it was still possible to breathe, although when Dr. Smith stood on a chair, he experienced a feeling similar to incipient faintness; "but the senses were not annoyed by anything beyond a feeling of closeness, by no means so unpleasant as a school room." This is an important fact, as Dr. Smith says, showing almost conclusively that organic matter is the cause of the unpleasantness to the senses on entering a school room; for there was comparatively little organic matter in the chamber, and the school room would have more oxygen than the chamber, the percentage found in the latter, after allowing the door to open for three persons to enter, being found to be only 17·45. The conclusion to be drawn from these experiments, therefore, is that the senses are bad and inefficient guides to the wholesomeness of air as regards the amount of oxygen and carbonic acid, save when the former is reduced and the latter increased to such an extent that the lungs seem to refuse to expand and the whole vital action is threatened with paralysis. Rooms, badly ventilated, which contain less than 20·7 per cent of oxygen are very unwholesome, and the necessity of taking into consideration the proportion of oxygen and carbonic acid in the sanitary inspection of factories and workshops is abundantly evident from the results obtained by Dr. Smith.

*Candles placed in a tin box over water, however, were found to burn till the oxygen was reduced to about 15·5 per cent: but in the lead chamber the candle is extinguished by the tallow refusing to melt. For this reason, miners incline their candles so that the flame may melt the grease.

Gathering Nicaragua Caoutchouc.

According to Paul Levy, the harvester of caoutchouc in Nicaragua goes to the middle of the forest to look for caoutchouc trees (*castilloa elastica?*), and when he has found one, he climbs to the top of the tree by the aid of a *gaucho* (a kind of hook) and by means of his gouge makes some zigzag incisions on the principal branches, communicating with each other, to form a kind of general gutter as far as the trunk. The gashes, which go through the bark, are only made on the under side of the branches, but on the trunk they are made all the way to the foot. Some trees give twenty pounds of caoutchouc; the liquid is received in calabashes, where it is coagulated by simply agitating and leaving to itself. To aid in coagulating, the natives use the stalks of certain branchy plants, which allow their sap to flow down and act as a coagulating agent. Caoutchouc of good quality cannot be obtained from trees less than fourteen years old. Unfortunately, the harvesting is done with little care, and the gashes almost always penetrate beneath the bark. A slightly larger yield is obtained, but it is destructive to the tree.

Preservation of Grain in Vacuo.

M. Louvel has brought before the French Academy a plan of storing wheat in portable sheet iron granaries, in which a vacuum is maintained equal to at least from three to four inches of mercury, this being found sufficient to destroy all insect life (although a more perfect vacuum is preferred) and to insure the evaporation of any moisture in the grain. The apparatus is of cylindrical form, placed vertically, and with convex top and bottom. The top is provided with an opening through which the inlet of the grain is had, with a valved pipe through which the air is exhausted, and with a gage by which the degree of exhaustion is indicated. The grain is removed through an opening (provided with a suitable closing device) in the bottom. The pump, which can be used for any number of the grain receivers, costs about one hundred and eighty dollars extra. In one experiment, where living insects were introduced in large quantities with the grain, it was found that they were all killed before doing mischief, and at the end of six months the wheat was found to be in as fine condition as at the outset.

M. LOUIS LA BRECHE VIGER, of Montreal, has obtained a patent for a new method of manufacturing axes, hammers, and other implements, by first making them of wrought iron and then converting them into steel. The articles to be treated are immersed in a bath of molten cast iron free from sulphur and phosphorus, and carburized to its utmost capacity. The best for that purpose is spiegeleisen, but such cast iron may be made by melting good malleable iron or blister steel in a cupola furnace. The articles are left in this bath a space of time which must vary, with the degree of hardness desired to be imparted to the metal and with the size of the articles, and also according to the intention of converting the whole mass of the metal into steel, or simply of converting the surface so as to contain a core of malleable iron.

A FEARFUL boiler explosion recently took place at Manchester, England. Five boilers, each 34 feet long and 5½ feet in diameter, were arranged side by side, each connected by a stand pipe with one horizontal steam pipe. Five safety valves were arranged on the horizontal pipe, one directly over each stand pipe; but no safety valves were directly on the boilers. During the repairing of one of the boilers, a workman had plugged up the stand pipe by which that boiler was connected with the horizontal steam pipe, and had neglected to remove the plug at the conclusion of the job. The consequence was that, when steam was raised, a terrible explosion took place, by which several lives were lost and much property destroyed.

USE OF SEWER WATER AS A MANURE.—According to the *Revue Horticole*, experiments with the sewer water of Paris, in the cultivation of certain lands below the level of the city, commenced three years ago, have been of the most satisfactory character: and the eagerness that the farmers now exhibit to obtain permission to use these waters on their lands, wherever it is practicable, is justified by the great increase in their value, many of them having previously been of little worth. Thus certain lands now rent for six and seven times as much per annum as formerly.

IT is curious how toothache gradually abates as you get nearer and nearer to the dentist's door. It seems almost as if your tooth were an intelligent being which turned coward when threatened, as bullies generally do. In such a case, the tooth has been made to understand that it was menaced, and has been frightened by a process of telegraphy between the mental and physical nerves.

THE interior of the Hoosac Tunnel has lately been photographed by the aid of magnesium lights, while the drilling machines were at work.

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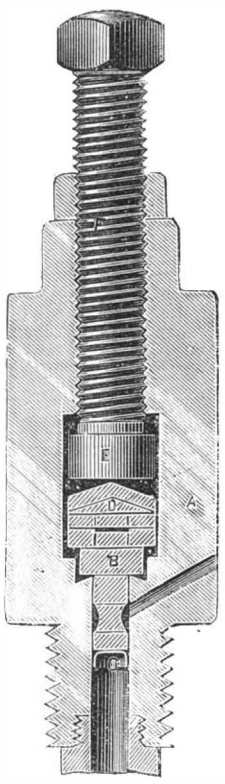
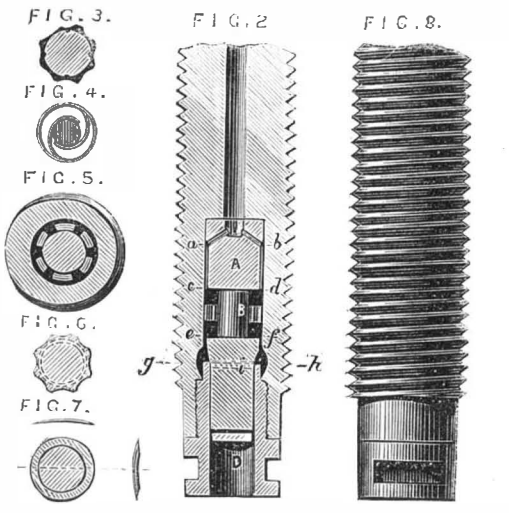
GUNPOWDER PRESSURE GAGES.

Amongst the various investigations, to which the great increase in the dimensions of modern artillery has led, is that relating to the pressure exerted within the bore of the gun by the ignition of the powder charge. The object with which the experiments in this direction were instituted was to determine the kind and quantity of the powder best suited for heavy guns. The Committee on Explosions, having the arrangement of the experiments, used the Rodman pressure gage in the first instance. This gage, we need hardly say, comes to us from the United States, having been devised by Major Rodman, the designer of the cast iron gun bearing his name. This gage is shown at Fig. 1, and in using it a hole is drilled through the gun at any point in the bore where it is desired to ascertain the pressure exerted by the exploding charge. Into this hole the tube, A, is screwed, its lower end, which is open, being flush with the bore. The other end is closed with the piston, B, the joint being rendered tight by means of the gas check, C. The piston carries a knife, D, and upon the knife rests a piece of copper, E, which is held tightly against it by the screw F. When the charge is ignited, the pressure of the gases on the base of the piston forces the knife into the copper, and the indent produced is held to be the measure of the pressure which has acted upon the base of the piston.



The results, however, which were obtained with this apparatus were so exceedingly variable that the committee were led to devise a modified form of pressure gage in which some of the causes of error inherent in the Rodman gage were eliminated. The crusher gage, as it is termed, is shown at Figs. 2 and 8, our illustrations having been prepared from drawings with which we have been favored by the War Department. This apparatus was made in the Royal Gun Factories, and consists of a screw plug of steel provided with a movable base, Fig. 3, which admits of the insertion of a small cylinder or pellet of copper, B, in the chamber, *c, d, e, f*. One end of this cylinder rests against an anvil, A, the other being acted upon by a movable piston, C, which is kept well up to the cylinder by means of a small spring, *i*. The copper cylinder is retained in a truly central position within the chamber by means of a small watch spring seen at Fig. 5. In order to prevent any possible leakage of gas into the chamber, the head of the piston is fluted, as seen at Fig. 7, as is also the body of the anvil, Fig. 4. Four small holes, *a, b*, Fig. 3, communicate with a main vent passing through the upper portion of the plug. Against the lower extremity of the piston a gas check, D, is inserted. The crusher gage is used in exactly the same way as the Rodman gage, being inserted at any required point in the bore of the gun. In the eight inch experimental gun the pressures are taken at intervals along the whole length of the bore, holes being drilled for that purpose. As the gases expand, following up the flight of the projectile, the pressures become weaker, the reduction gradually increasing towards the muzzle as the expansion increases. The forward gages are therefore provided with cylinders made from a softer metal than those used at the immediate point of explosion. In the thirty-five tun gun, the pressures are taken at three points, at the end of the bore, at the vent, and at the base of the projectile. The gage for the end of the bore is placed in the



center of a shallow copper pan which is inserted at the muzzle of the gun and carefully pushed down the bore by means of a detachable rod, the same implement being used to withdraw it after a charge has been fired. The vent gage is inserted in the vent hole, while that for the projectile is placed in a hole made in the base to receive it. The gun is fired by electricity, the wires being inserted in the powder charge before it is placed in the gun. To prevent jamming, they are laid along a groove cast on the outside of the projectile, both powder and shot being rammed carefully home together. The action of the apparatus is very simple. Upon the explosion of a charge, the gas acts on the area of the piston and crushes the copper cylinder against the anvil. The amount of compression which the copper thus sustains becomes an indication of the pressure exerted upon the piston. The area of the copper cylinder found most suitable for the eight inch gun is one twelfth of an inch, the piston area being just double, or one sixth of an inch. In order to obtain data whereon to base the calculations of the pressures, a series of experiments were made, by means of a testing machine, to determine the pressure required to produce a definite amount of compression in copper cylinders, similar to those used in the instrument. The results of these experiments were tabulated, and they furnish a means of comparison whereby the amount of compression produced in the crusher becomes a direct indication of the pressure exerted by the gases at that part of the bore or chamber where the gage is placed.

The results of experiments show that, in the case of R. L. G. (rifle large grain) powder, the indicated pressure was from 22½ tuns to 40 tuns per square inch.

During the year 1870, the Russian Government instituted a series of experiments in this direction with 6, 8, 9, and 11 inch breech loading rifles, and 15 inch muzzle loading smooth bore guns. The object of the experiments was to ascertain the comparative action of grain and prismatic powders in heavy charges, and also to determine the charge suitable for each class of guns. The pressures varied with the charges and projectiles, from 11 tuns to 18 tuns per square inch.

These experiments led to the decided preference of prismatic as against grained powder. With equal velocities, the grained powder developed more than twice the pressure obtained with the prismatic powder. This wide difference, however, was only developed when the velocities were very high; and the higher these ranged, the greater the difference of pressure became between the two powders—always showing in favor of the prismatic. The experiments also indicated the great importance of the size of the diameter of the cartridge in muzzle loading guns, and of the length of the powder chamber in breech loaders. For instance, in the 15 inch gun, the velocities were equal with charges of 75 pounds and 100 pounds, when the diameter of the first was 12 inches, and that of the last 9·7 inch.—*Engineering*.

ON ICE, WATER, VAPOR, AND AIR.

[Report of a recent lecture by Professor John Tyndall, before the Royal Institution.]

Attention was first directed to a large tub in front of the lecture table, containing a freezing mixture of pounded ice and salt, in which were embedded some iron bottles with plugs screwed into their necks, and a large bomb shell, all of which were completely filled with water. Water, when frozen, expands, and these vessels being completely full, it can only do so in their case by rupturing the iron envelope which incloses it, which the speaker hoped would be the case during the following hour.

The great body of the light rays from the sun, and even a portion of the dark ones, pass through ice without losing any of their heating power, and when properly concentrated on combustible bodies, their burning power becomes manifest even after passing through the ice. In an experiment made by Dr. Scoresby, in the polar regions, he succeeded in so concentrating the sun's rays by an ice lens, as to make them burn wood, fire gunpowder, and melt lead; thus showing that the rays of the thing we call radiant heat retain their power even after they have passed through so cold a substance.

Yesterday we succeeded in making a very beautiful ice lens with which we burnt paper, ignited matches, lighted cigars, and exploded gunpowder by the light or by the heat rays—for they are synonymous. I may add, that Mr. Faraday, in summer weather, has been fortunate enough to get a sunbeam through an aperture into this room, and after passing it through an ice lens, to explode gunpowder.

I take this slice from a block of ice and place it in this hot mold, and in a few minutes, as you see, we get it beautifully convex. The lens thus made was held in front of the electric lamp so as to include the whole beam, and a cone of light having its apex a few feet from the lamp was very visible; black paper and matches were ignited almost instantaneously when held at the point, and gunpowder was also exploded; thus verifying and repeating with the electric lamp Scoresby's experiments with the solar rays. We have all these wonderful effects produced by heat which has passed through so cold a body as ice.

I want you to take notice of the small still which is at the corner of the table. The small boiler contains water which is now getting hot, but as yet no steam has been formed; the water surrounding the worm is ice cold, and the glass vessel which will collect the distilled water is now quite empty. In a little while I shall revert to this again.

Now let us mark the wonderful power of ice to mold itself to the valley through which it passes, as exhibited in the glaciers of Switzerland, where the ice can accommodate itself to the flexures of the valley, and the immense masses of ice, which are the tributaries of the Mer de Glace (the Cascade du Taléfre, the Glacier du Géant, the Glacier de Léchaud, and the Glacier des Périades), weld together and squeeze themselves into the extraordinary small space we find at the gorge of Trélaporte. Is not this a wonderful proof of the yielding power of ice?

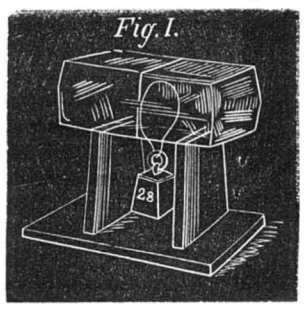
Now I want to make plain to you the possibility of a substance like ice, being squeezed in this way, changing its form but not its volume, and appearing after that change as solid and homogeneous as before. Below the freezing temperature ice is a very hard, brittle substance, but above the freezing point it is much softer and more yielding; it can be readily cut with a knife. But there is something more to be observed; ice not only can be cut with ease when it is melting, but it reunites as readily. This curious phenomenon was first observed by Mr. Faraday who found that, when two pieces of ice with moistened surfaces were placed in contact, they became cemented together by the freezing of the film of water between them, while, when the ice was below 32° Fah. and therefore dry, no effect of the kind could be produced. The freezing was also found to take place under water, and, indeed, it occurs even when the water in which the ice is plunged is as hot as the hand can bear.

Dr. Tyndall then repeated Faraday's experiment. A slice was sawn off a large mass of ice, and then laid on the place from whence it had been cut; a few moments rendered the junction as complete to all appearance as the rest of the block, and the large mass was lifted from the table by the re-united slice. Two smaller pieces of ice were then held closely together in a vessel of warm water, the result being the same as before—one mass of ice in place of two.

It is one of the most valuable features of the science we are studying, that it encourages thinking over facts; by reflecting on these facts, many additions have been made to our knowledge of glaciers and icebergs. This phenomenon is known as regelation. Icebergs are sometimes formed in the open sea by the linking together in this way of separate pieces of ice, and still more frequently icebergs coalesce and form huge chains and islands of ice in mid-ocean by the refreezing of the contact surfaces of melting ice.

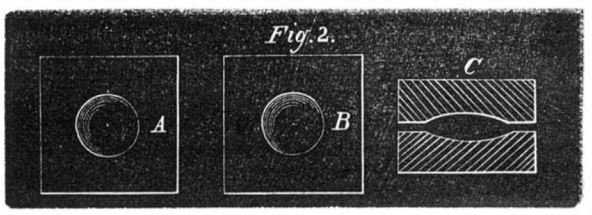
Generalization from these interesting facts led Dr. Tyndall to conclude that a bruised mass of ice, if closely confined, must re-cement itself when its particles are brought into contact by pressure; in fact, the whole of the experiments about to be recorded immediately suggested themselves to his mind as natural deductions from the principle established by Faraday.

Professor Bottomley made an experiment recently, which, as it bears upon this subject, I have set going for you. A block of ice (Fig. 1) was placed on two uprights, with a loop of wire round it, to which was attached a twenty-eight pound weight. The wire immediately began to enter the ice and passed right through it, afterwards dropping down with the weight; but the ice remained undivided, and except for a little opacity along the plane of passage, showed no signs of ever having been divided.



Now let us ask ourselves what must become of the snow granules when they are squeezed together? Every boy knows that they cohere and form a snowball. Salt will not act so. I have no snow, but I can find a substitute for it. Snow is frozen water, and so is ice; if I scrape down this ice into a powder, we shall find it a very good substitute. This was done, and in order to make the snowball firm, the first rough mass was put in a boxwood mold and squeezed in the shape of a sphere, by a hydraulic press. The operation was then repeated, the mold being opened and more ice powder, or rather ice slush, being added, each time, until at length a beautiful solid ball of clear ice was obtained, which, from its containing scarcely any air in its interstices, was rolled before the boys as the firmest snowball they had ever seen.

Dr. Tyndall then made a number of experiments proving how readily ice can be molded to any shape. Were the result worth the labor, it would be possible to make vases and statuettes, to bend it into spiral bars, or even to form a knot upon a rope of ice by the proper application of pressure.



Two pieces of seasoned boxwood, A B (Fig. 2), having corresponding cavities hollowed in them, so that when one was placed on the other a lenticular space, C, was inclosed, had a rough sphere of ice scrapings placed between them, and were subjected to the action of a small hydraulic press. The ice crackled a little, and in a few moments a lens of compact ice was taken from the mold. This lens was in its turn placed in the mold. This consists of a block of boxwood having in it a hemispherical cavity, and covered by a second block, upon which a hemispherical protuberance, smaller than the cavity, has been turned; so that when the latter is placed in the former, a space of a quarter of an inch exists between both.

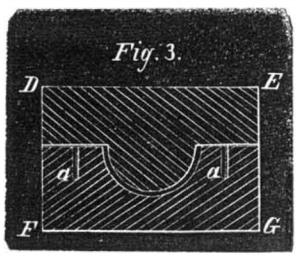


Fig. 3 represents a section of the two pieces of boxwood; the brass pins, *a a*, fixed in the slab, D E, and entering suitable apertures in the mold, F G, being intended to keep the mold concentric. After the ice was subjected to the hydraulic pressure for a few minutes in this mold, it was taken out as a smooth compact cup, its crushed particles having reunited and established their continuity. The cup was filled with wine to prove the perfect cohesion.

At this point of the lecture, the bomb, before mentioned, in some unexplained way exploded; it did not, as was expected, burst, but shot out the screw plug with great violence up into the gallery of the theater; the iron bottles were ruptured with very little noise, but were split from end to end, thus impressing the fact very forcibly on the young

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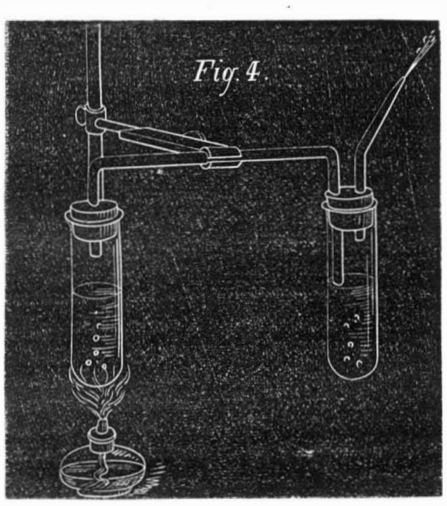
-hearers, that when ice freezes it is larger than the water from whence it comes, and that it cannot freeze without undergoing this change of bulk, which will burst almost anything.

Two cups were next made in the mold above described, and a piece of sealing wax being placed in one, the other was brought down upon it, so that their pieces met, when a momentary squeeze with the lecturer's hand joined them together into a hollow globe. Rings of ice, which had been molded before the lecture, were joined to form a chain; indeed, there is scarcely any limit to these experiments, if time would permit.

The effect of subjecting ice to strain and pressure, when below the melting point, was next demonstrated. This was done by crushing chilled ice in an iron mold; a series of loud cracks announced the rupture of the ice under these circumstances, and at the end it presented itself as a white powder, looking very much like rough salt.

You can now understand how a substance which so readily changes its form under pressure, and so readily re-unites itself when broken, can be forced through narrow gorges, and can accommodate itself to the bendings of the valley through which it moves. But there was another famous theory, which will lead me to say something about another property of ice. If you melt a quantity of ice, the water produced is not quite so big as the ice, and if you freeze water, the ice produced is somewhat bigger than the water; and as you have just now seen, the water swells in freezing, and the force with which it swells is enormous. It was this force that some eminent men thought to be the power which urged the glaciers continually downwards. But the glacier is not continually converting water into ice, as this theory supposes. This experiment leads me to think that you would like to see water frozen and a little bombshell burst in a red hot vessel. But you must first give me your attention while I explain the process.

Let us look at the still which, at the beginning of the lec-

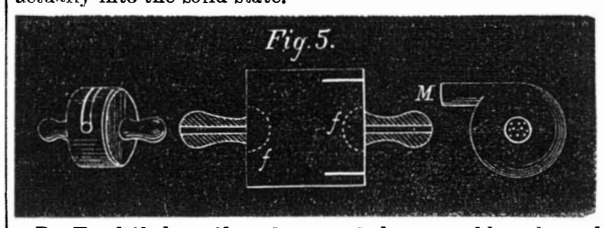


ture, I put in action. You see that in this space of time but a very small quantity of water has distilled; but look at the worm tub, and you see that a large quantity of water which was ice cold at starting has been made itself to steam—by what? By the heat which that small quantity of water contained when it was steam.

You can also boil water in one vessel by the steam generated in another, and thus actually measure the heating power of the steam. Two wide test tubes (Fig. 4), connected by a piece of quill tubing which, starting from the neck of one, goes to the bottom of the other, were about half filled with water; and a spirit lamp, placed under the first, in a short time created sufficient steam to pass into the second tube; but, however familiar the result, it was almost startling to see how very much more rapidly the second was made to boil, by the steam which was passed into it, than that had done which had been heated by the lamp, and also the minute increase in bulk of the liquid.

The rule is quite general that, when a liquid passes to the state of gas, heat is consumed, and if heat be not supplied, intense cold is produced. Ether poured on the hand produces an extreme feeling of coldness from the rapidity with which it evaporates. And the rule is just as general that when a solid is dissolved, heat is consumed and cold produced. This explains the coldness of the mixture of salt and pounded ice, or salt and snow—the salt causes the ice to melt, and thus produces great cold. Salts which dissolve with great rapidity produce a correspondingly great degree of cold. This has been taken advantage of by many persons who have invented different kinds of freezing machines. That which we have here is by Mr. Ash, and the ice which I turn out has been produced by the absorption of heat by liquefying certain saline substances, without the use of snow or ice.

We are now prepared for an experiment. There is a gas, which is a very heavy one, often found in brewers' vats, at the bottom of deep wells, etc., a poisonous gas; accidents happen sometimes by the men, who go into these vats to clean them out, not taking sufficient care to see that this gas is first removed. It extinguishes flame, and has many more remarkmarkable qualities. This gas is carbonic acid; now when this gas is subjected to very great pressure, its particles are squeezed closer and closer together, until at length it becomes a liquid. In doing this, the gas gives off a great quantity of heat, the vessels and the pumps becoming very hot. This you understand from what you saw and were told in the earlier lectures. I have some of this liquid gas in this iron bottle. When the cock is turned on, what takes place? Some of the liquid is immediately turned into gas, and takes up, in so doing, exactly the amount of heat it lost in being converted into liquid carbonic acid; but this is done with exceedingly great rapidity. Where is the heat, that it requires, to come from? All the tubes and vessels through which the liberated gas passes become intensely cold, the air in the immediate neighborhood is robbed of all its moisture which falls as snow, but even the heat from these sources is not enough, and it gets the remainder from itself. The total amount of heat, required for part of the liberated gas, is got at the expense of another part, which loses so much heat that it becomes converted, not into the liquid but actually into the solid state.



Dr. Tyndall then allowed some of the gas to blow through a suitable vessel (Fig. 5) for retaining the solidified gas, and in a few minutes exhibited the carbonic acid snow in considerable quantity.

The recipient for the solid carbonic acid is an ingeniously constructed draw out box, the contrivance of M. Thilorier. It consists of a brass cylindrical case, having tubular handles affixed to its ends. Plates of pierced brass are fixed before the outlet of each handle as shown by *f f*; these act as sieves, to keep back the solid acid and allow the gas to pass out. The box has a short tube joined to the side, as in the sectional drawing, so as to form a tangent to the inner circle of the case, and opposite to this tube is placed a bent piece of brass, in order to prevent the violence of the inrushing gas from blowing the solid matter into such fine particles as would enable it to pass through the perforated disks. For the purpose of taking out the solid, the box is made separable, by one end sliding over the other, and retainable together by two obliquely grooved holders placed on opposite sides of the joint. When being used, the tangent tube fits over the nozzle of the gas bottle.

Following out the rule we laid down, if we liquefy this solid, or dissolve it rapidly, the reduction of temperature is now something beyond what can possibly be borne by living creatures. Faraday proved this temperature to be nearly 140° below the freezing point of water, and he made it lower still, by putting it under the receiver of an air pump and exhausting; the temperature thus obtained was 166° below zero, or 198° below the freezing point of water.

If I hold this test tube with the mixture of ether and carbonic acid in it in the electric beam, you can see, not only the hoar frost upon it brilliantly illuminated, but also that the cold in its neighborhood is sufficient to condense and refrigerate the moisture dissolved in the warm air of this room, and in consequence, a miniature fall of snow is produced.

It is plain that a sufficient degree of cold is produced by this mixture to freeze the water in our little glass bomb as we proposed, but how can this be done in a red hot vessel?

Leidenfrost observed that if a sheet of metal, such as this silver basin, is made very hot, and that then a drop of water is allowed to fall upon its surface, the liquid does not boil, but instead of wetting the surface as usual and fizzing off in steam, it rolls about in a lively way in a spheroidal shaped mass (Fig. 6). The reason of this is that the temperature of the basin is so high that it immediately converts any liquid that touches it into vapor, upon which the liquid rests as on a cushion; in fact, the water is lifted up from contact with the hot metal by a spring of its own vapor; so that you see the possibility, at any rate, of a very hot and a very cold substance being very near together, so near as apparently to be touching each other, and that, nevertheless, the distance between them may be sufficient for each to maintain approximately its own temperature.

A mixture of solid carbonic acid and ether was then placed in a red hot platinum crucible, fixed in a circular hole in a large plate, to avoid firing the ether vapor by the flame of the lamp, and a glass tube, having a bulb filled with water at its end, was used to stir about the freezing mixture; in a few minutes a solid lump of ice was produced as it were from the center of a fiery furnace.

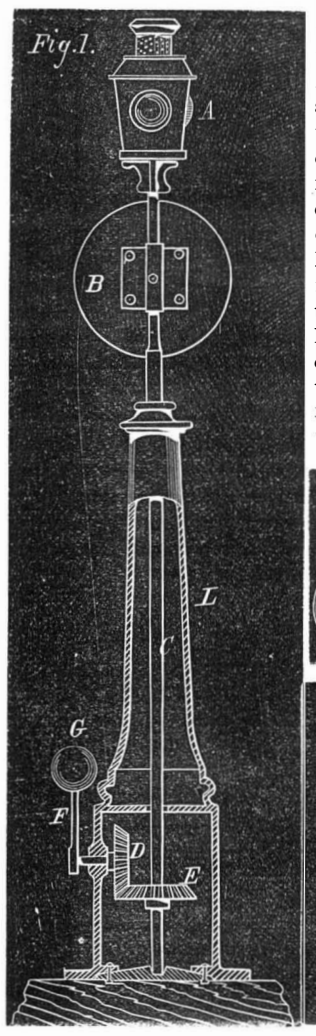
Some of the peculiarities attending cleavage were then touched upon. The little atomic bricks which form crystals often arrange themselves in layers which are perfectly parallel to each other, and which can be separated by mechanical means. Rock salt can thus be cut up into layers, and these layers may again be divided in certain other definite directions. There are, however, other phenomena to which the term cleavage is applied, and in some of these the cleavage only takes place in one direction. Sandstone cleaves in planes parallel to its bedding lines. Among the substances capable of cleavage, slate ranks very high; the blocks in which it is quarried cleave with the utmost facility into thin laminæ, which can be split up again almost indefinitely if the instruments be fine enough. Many theories explaining this peculiarity of slate have been promulgated, but at last it was found that the lamination of the mass was produced by pressure, and that these planes of cleavage were invariably at right angles to the direction of the pressure.

The flattening out of fossils in the slate forms an additional proof of the correctness of the conclusion. Some specimens were exhibited, showing the distortion of trilobites and shells.

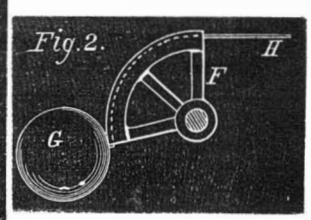
The same cause, which produces the cleavage planes of slate rock, also produces the veined structure of the glaciers. The ice of the higher regions is whitish, through the diffusion of small air bubbles within it. At the sides of the glaciers and at the bottoms of cascades, this ice is sometimes subjected to enormous pressure. It yields laterally as the slate mud has yielded, and a laminated structure is the consequence. On the surface of the glacier, under the medial moraines, and on the sides of the crevasses, the lamination reveals itself as clear blue veins or streaks drawn through the whiter ice.

NEW DEVICE FOR RAILWAY SIGNALS.

Our engraving illustrates a new form of railway signal which is now being introduced along the line of the New York Central and Hudson River Railroad.



In Fig. 1, A—the lamp in which bull's eye lenses of white and red glass are arranged—and B—the target—are attached to the rod, C, which passes through the ornamental iron post, L. The rod is arranged so as to be easily revolved by the action of the miter wheels, D and E. To the wheel, D, by means of a rod passing through the post, the lever, F, is attached, at the end of one arm of which is a solid weight, G. The form and arrangement of the lever and weight are shown in Fig. 2.



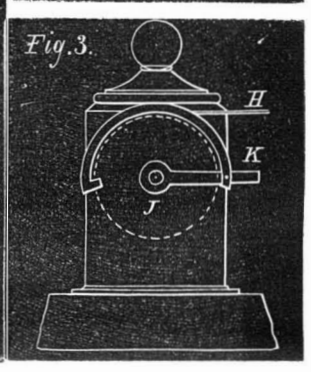


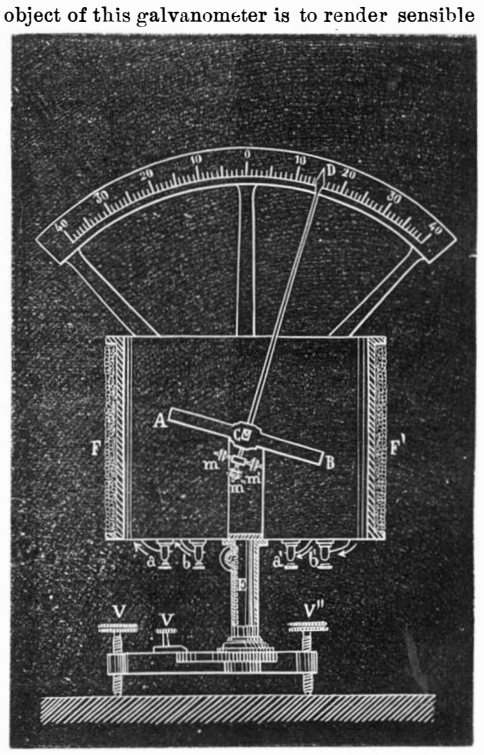
Fig. 3 represents the signal post, on the exterior of which is a hand lever, K, working in a semicircular guide and turning the sheave, J, within the post. To the circumference of this sheave, the wire, H, is fastened, passing therefrom over other sheaves for a distance of from 1,000 to 2,000 feet, until it reaches the lever, described on Fig. 1, to which it is attached, as shown on Fig. 2.

By raising the hand lever, K, the sheave is turned, and the force communicated to the wire raises the lever, F, and weight, G, which, by the action of the miter wheels, revolve the rod, C. By this means, the red or danger side of the target and the red light are displayed. On returning the lever, K, to its former position, the wire is loosened, and the weight, G, falls, turning back the lamp and target.

The apparatus was devised by Mr. J. M. Toucey, the superintendent of the road, and is now in successful operation at many points along the route.

VERTICAL BALANCE GALVANOMETER.

The object of this galvanometer is to render sensible to a



large audience the existence of weak as well as strong currents of electricity, without the necessity of employing any

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expensive or cumbersome accessories, such as a lantern to project a magnified image of the galvanometer needle and scale on a screen, in order to render the deflections more evident.

The chief part of this apparatus is a balance beam, A B, of magnetised steel poised on knife edges, as in a common weighing balance. At right angles to this beam is fixed a long pointer, D, the point of which can be adjusted at zero by means of two thumb screw weights m, m^1. The sensibility to motion of the beam can be rendered greater or less by screwing up or down the weight m^2.

The magnetized beam is placed in the center of a bobbin ring, F F^1, of dimensions sufficiently large to render the action of the current on the beam practically the same at whatever angle the beam may have turned through. The sensibility of this instrument will be seen when it is mentioned that the current produced by merely bringing the hand near a thermopile will give a very large deflection. The beam of the instrument can be removed and remagnetized with great facility if its polarity by any means becomes destroyed or reversed. It is necessary, in setting up the instrument, to place it in such a position that the vertical plane passing through the beam may cut the magnetic meridian. It is sufficient if the part of this plane which contains the south pole of the beam makes, with the south pole of the dipping needle, a less angle than 90°.—*Mechanic's Magazine.*

Telegraphy without Insulation.

Mr. H. Highton recently read a paper on this subject at the meeting of the Society of Arts in London. He showed by experiment that water itself is for electricity of low tension so perfect an insulator, that a long wire on a plate of copper charged with electricity of low tension will retain the charge even for hours; indeed quite as obstinately as the glass of a Leyden jar retains a charge of high tension. The instrument he proposed to use for submarine telegraphy is a light slip of gold leaf, weighing from one 500th to one 2000th part of a grain, acted on by a powerful electric magnet, and with its motions optically magnified. The delicacy of this is so great that simply looking at a thermopile will transmit a visible signal through the resistance of the Atlantic cable, and a kiss or grasp of the hand a very strong signal. So that a modern Pyramus and Thisbe might exchange salutations not through a hole in the wall, but through the breadth of all the waves of the Atlantic. The use of this instrument gives an opportunity of using electricity of the very lowest tension which, besides its other advantages, has a much less tendency to escape by faults in the wire. It was shown that a fault which caused the disappearance of all visible signals through Thomson's speaking galvanometer, with a resistance oi 500 units, or about 125 miles of the Atlantic cable, would still allow intelligible signals to be transmitted on this instrument with 10,000 units, or 2,500 miles of resistance. The other advantages were the absence of all swing, such as there is in a needle, and an instantaneous movement, in spite of electrostatic induction. Where it requires two or three seconds for the wire to accumulate sufficient charge, to overcome the initial friction in any instrument where there is any friction, however slight, it moves at intervals of seconds by jumps, but the gold leaf, having no friction, begins to move instantaneously and proceeds by an equable motion. Again, where increased sensitiveness is required, the only thing necessary is to increase the force of the electro magnet at the receiving end. The conclusion the author drew from his experiments was that, instead of the hundreds of thousands of units of insulation of the present cables, it would be quite feasible to work through a cable having only a single unit of insulation; or if greater insulation were desirable, a wire might be used presenting much more resistance to the currents, such as a steel wire, possessing more strength and cheaper than copper, and that electrostatic induction being less injurious, much cheaper, with less gutta percha, cables might be used costing some fifth or sixth of the present prices, and that thus telegraphy might be made much cheaper and more available for hundreds of thousands of poor emigrants, instead of being the luxury of rich merchants, or speculators, or government officials. £50 a mile ought to provide a wire, sufficient for all purposes, of any required length.

Vitrified Marble.

The material itself results from the admixture, and melting together in a furnace, of equal parts of certain vitreous and silicious substances in about equal proportions, to which are added, at a suitable stage and in the requisite quantities, such coloring materials as will produce the desired effects, either as a plain body color equally diffused throughout the mass, or in veins of one or more colors with or without ground. When in a semi-fluid state, while yet hot, small or large masses of this plastic matter are cut off and pressed into iron or steel molds carefully formed to the desired shape. In this manner decorative objects of any size, shape, or appearance can be produced with the utmost facility and rapidity of execution.

The manner in which natural materials of all kinds can be imitatively reproduced is extraordinary; ordinary marbles, veined and other, porphyry and malachite, jade, lapis lazuli, etc., thus prepared are, if anything, more real than the genuine objects themselves, and have the advantage of being in forms that could only be obtained out of the originals with great labor, waste, and cost. They can also be obtained and applied in bulk and solid masses, as for vases paper weights, inkstands, table tops, etc., or in minuter portions, such as pateræ and tesseræ, or amorphous pieces for mosaic work in every variety, suitable for dadoes, pavements, etc. For the latter purpose, the vitrified marble paving possesses an important advantage over marble and encaustic tiles, in relation to the surface, which is rougher and more safe and pleasant to tread upon, giving good foothold and equable wear, while lending itself to every pattern, regular or the reverse. And it is not only in respect of mere surface patterns, but also of raised designs and molded forms of every species, that this material is susceptible of adaptation. Indeed, the sharpness of definition and accuracy of detail, of which it admits, are alike noteworthy.

It cannot, moreover, be said of this invention, as of so many others, that the fairness of its promise in conception is marred or belied in practical application. On the contrary, it is sufficient to say that the most eminent architects of the day have given their testimony, in evidence of its merits, by adopting it in leading works, which are alike monuments of their skill and of national objects. Mr. G. Gilbert Scott, for example, has made use of it largely in the bosses and gems for the decorative work of the Royal Albert Memorial in Hyde Park; and nearly 2,000 of these ornaments have been introduced therein, studding and decorating the work with equal brilliancy and effect. Jesse Rust, of 15 Coleman street E. C., London, England, is the patentee of the above material.

Correspondence.

The Editors are not responsible for the opinions expressed by their Correspondents.

Petroleum and Coal.

To the Editor of the Scientific American:

I find, in your paper of May 25th, an article copied from the *Petroleum Monthly*, in which the statement is made that no coal beds, capable of being worked, are to be found within fifty miles of the oil producing territory. This, to the oil men of West Virginia, is indeed a startling assertion, as we obtain all our fuel from the same hills on which the wells are located; and, within the present month, an instance occurred wherein a party engaged in boring struck, as they supposed, a crevice of five feet, and knew no better until a miner came up and informed them that their auger had come through and, barely missing the mule, had disabled their car by falling through it; in another instance, a well, deserted as non-paying prior to the introduction of torpedoes, was leased by other parties; and in attempting to tube it, the hole was found obstructed and a man was sent into the coal bank about 100 feet below; and it was found covered with a pile of slates. In both these cases, the vein was about five feet thick and of a very good quality of bituminous coal. All the wells located on the hills pass through at least one vein of coal, and most of them through two veins; in some cases these amount in all to nine feet in thickness. It seems incredible that any one should undertake to write on a subject in which he is so lost as to assert that "in boring for oil, no coal has ever been found even in the smallest quantities." Again, the writer asserts that there is no evidence that petroleum is not derived from bituminous coal by distillation. If such were the case, could we not reasonably expect to find at least a trace of petroleum in the rocks adjacent to the coal? But the facts are that at least one hundred feet of strata intervene before we reach the first rock in the least impregnated with petroleum. Nor do we have any reason to believe that it is derived from the limestone, as we have the best authority that limestone under high pressure does not part with its carbon on being heated, no matter how intense the heat; and we do not find the oil in the limestone, but above it, in the sand rock. He admits, also, that carbon does enter into the composition of petroleum; but does hydrogen, to any extent, enter into the composition of coal or limestone? And if not, whence is derived the hydrogen to constitute the hydrocarbon? He then asserts that "petroleum is certainly a mineral oil," an assertion which the facts do not warrant, as geologists agree that coal is of vegetable origin. Again, as to the reproductive power of wells; if he will take into account the increased experience and facilities, added to the fact that, in all territory where surface water is not allowed to flood the wells, the salt water is becoming exhausted, and oil which was held back is allowed to flow down to the bed rock and reach the wells, also the fact that much of the oil is not in crevices but merely confined in the porous sand rock, and, as the cavities are emptied, it oozes out where it reaches the pump, he can readily account for this "reproductive power." I am not in the habit of catching folks on pin hooks, but when I see an article going the rounds of the scientific papers, so at variance with the plain facts of the case, I feel called upon to refute it, as my idea of science is that it is "truth demonstrated."

As one who has spent years in the oil regions and tried to arrive at the facts, I might say much that would at least have the merit of being scientifically correct, but I defer for the present, being firm in the conviction that enough has not been said to arrive at the "Origin of Petroleum," a knowledge of which would assist, as well in the location as in the working of the wells. G. W. S.

The Rubber Tip Pencil Case.

To the Editor of the Scientific American:

My attention having been called to-day to your editorial on the decision of Judge Benedict in case of the Rubber Tip Pencil Company *vs.* S. D. Hovey *et al.*, I desire to correct several errors therein contained. First, this case is wrongly reported both in your paper and the Patent Office *Official Gazette.* Judge Benedict declined to hear the above case, and it came before Judge Blatchford in April, who dismissed the bill with costs. The only case heard or decided by Judge Benedict was the case of the Rubber Tip Pencil Company *vs.* Howard, Sauger & Co., which was materially different from the case against Hovey, as it contained no question of estoppel and was decided nearly two months prior to Judge Blatchford's decision. Your most serious error, however, is in construing Judge Benedict's decision into an opinion that attaching rubber to a pencil for erasing purposes, for convenience, is not patentable; for the learned Judge says nothing which can possibly be construed into such an opinion. Blair did not claim to be the inventor of attaching rubber to pencils for erasing purposes, but only claimed to be the first inventor of a rubber cap or tube (or as Judge Benedict describes it, "a piece of rubber with a hole in it") which could be applied to a pencil. If Blair had contented himself with claiming rubber on a pencil, the result might have been different, but in claiming it broadly, off or on, he claims nipples and every style of rubber with a hole in.

As I fully agree with your views as to the patentability and importance of the invention of combining rubber with a pencil for convenience in erasing, and as I believe Judge Benedict has the same views, I deem it but justice to him to correct these errors, into which almost every casual reader of this decision has fallen. SAMUEL D. HOVEY,

President of Goodyear's Rubber Head Pencil Company, 205 Broadway, New York.

Novel Method of Indicating a Hot Journal.

To the Editor of the Scientific American:

My ingenious and able colleague, Dr. Mayer, has recently been experimenting, during the course of an interesting investigation, upon a number of substances which change color on raising their temperature and regain their original hue when cooled.

Iodide of mercury is one of these substances, and he suggests that if a bearing, to which access is difficult while machinery is in motion, or which, for other reasons, cannot be conveniently reached by the hand and its condition thus known be painted with iodide of mercury or some such material of changeable color, its darkening when the journal heats, may make it a valuable indicator. Its change—from bright red to black at about 70° C.—would attract attention from a considerable distance.

I have sent you this suggestion, as I have no doubt that it may prove very useful to some of the readers of the SCIENTIFIC AMERICAN. R. H. THURSTON.

Stevens' Institute of Technology, Department of Engineering, Hoboken, N. J.

Sea Sickness.

To the Editor of the Scientific American:

In your issue of May 18th, you have an article on sea sickness which attempts to give a philosophical explanation of the phenomenon, namely, pressure of blood upon the brain during the forward pitch of the vessel. Sickness from swinging is referred to the same cause. The proper position to lie on board a pitching vessel is given as being with the head toward the bows, etc. In all the cases referred to, the motion was either rising and falling, or gyrating.

I was a witness and a sufferer in a case of sea sickness, wherein the conditions were so different from all other cases I ever heard of that I thought them worth the consideration of those who wish to account for sea sickness, especially as I could not see how the above explanation could account for this case.

Some time ago, while riding in the cars between Cleveland and Columbus in Ohio, one side of the engine became disabled and all the work fell upon one cylinder. All went well enough till we came to an up grade, when the engine stopped with piston at the dead point. The engineer contrived to start again, but the motion, for every revolution of the drivers, was alternately fast and slow, being almost nothing at the dead point, *crescendo e diminnendo.* In a few minutes I began to feel sick, and as the train did not move faster than I could conveniently walk, I got out and kept along with it. I was soon joined by others who said they were sea sick, and I suppose that half the passengers in the car I was in felt the symptoms of sea sickness, which lasted as long as the irregular motion. Now this motion was straightforward, no pitching, rolling, swinging, or turning, and no position that could be assumed would avail against its unpleasantness. There was nothing about it to determine the blood to the head rather than anywhere else, as far as I see. I submit the case to those whose business it is to explain it. A. E. DOLBEAR.

ANOMALOUS SPECTRA.—A recent number of Poggendorff's *Annalen* contains a short but interesting paper by Christiansen of Copenhagen, in which he states that a hollow prism filled with the alcoholic solution of fuchsin produces a highly anomalous spectrum, which, instead of proceeding regularly from the red to the violet, like the ordinary solar spectrum, stops at a certain point, returns backward, then stops again, and resumes a direct course to the end. Kundt finds that anomalous spectra are given by all the anilin colors, and by permanganate of potash. Such spectra generally turn back upon themselves, having the green at one extremity, the blue being situated between the green and the red.

PUBLIC CLOCK REGULATORS AT PARIS.—In the various squares and public places of Paris, instruments are being put up for the regulation of clocks and time pieces. This little invention of M. Detouche, the well known clockmaker, called the equatorial quadrant, appears to be a complete epitome of practical astronomy, as by it the true mean solar time can readily be determined anywhere, on the spot. M. Detouche has supplied numerous models of his invention, adapted for a variety of situations, and the little instrument is said to be coming into very general use.

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CORKS AND CORK CUTTING.

The cork tree is a native of Spain and Portugal, being found in the latter country in large numbers in the vicinity of Lisbon. A recent visit to that capital afforded us an opportunity to inspect the method of obtaining this useful material directly from the trees, and a stroll through some of the cork cutting establishments in this city enables us to trace the progress of the bark from the time it is removed from the forest to its final entry into our American market.

Cork is the soft cellular interior bark found in a peculiar variety of the oak (*quercus suber*). It lies inside of the exterior woody covering, growing from year to year as the diameter of the tree increases. During the first fifteen or twenty years of its existence, the cork contains considerable wood, which impairs its elasticity and renders it unfit for use, so that until the tree has attained the above mentioned age, the material is not fit for the market. After that period, the cork begins to die. Its growth ceases, and the trunk, continuing to increase in diameter, splits it off in layers which are removed every eight or ten years, the quality of the material improving by age. The tree does not suffer from the process, as it generally lives from one to two hundred years.

The cork is removed by first making several longitudinal clefts up and down the trunk, and then girdling the latter by horizontal incisions. The bark is pounded, detaching it from the tree, so that afterwards it is easily removed by the wedge-shaped handle of the axe used for cutting. This labor is done almost entirely by a peculiar tribe of nondescript beings, either Indians or gypsies who, originally inhabiting the mountainous regions in the north of Portugal, seem at present to have abandoned their wild life, as they perform most of the menial work of the country.

The layers of bark as they are removed are first soaked in water and then blackened over a coal fire, the object of this proceeding being to make the surface smooth and at the same time to conceal any flaws in the shape of knots or cracks which may be visible thereon. They are then pressed and finally packed on lighters, for transportation down the Tagus river to the warehouses of Lisbon. These lighters are vessels of peculiar shape, as they are of very broad beam though having a sharp bow.

Thwartships the boat, poles are placed quite close together, on which the layers of cork are heaped to a hight of fifteen or twenty feet, often loading down the lighter until the water reaches her gunwale. The means of propulsion is a three cornered sail, and the crew consists usually of three men, dressed in a highly picturesque costume, who contrive by the aid of long oars to manage their craft, in spite of the strong tide which often renders navigation a matter of difficulty.

After being received at the warehouses, the large sheets are cut into pieces of about three and a half feet in length, eighteen inches in width, and ranging from one half inch to three inches in thickness. Drying and packing in bales weighing one hundred and fifty pounds each follows, and the cork is ready for exportation.

We next find it in the hands of the cork cutter in this country, who pays from five to twenty-five cents a pound for the rough material in the bale. As the latter is unpacked, the slabs are inspected and assorted according to their sizes and quality, those of the finest texture being of the greatest value. They are then placed in a steam chest and steamed, by which process the material is softened and rendered easy to cut. A vertical revolving circular knife, operated by steam power in the same manner as an ordinary circular saw, now divides the sheets into narrow lengths and again cuts them into small squares—the dimensions of the latter being governed by the size of the corks into which they are to be made. It is well known, that, in order to cut cork, a drawing motion must be given to the knife. Crushing strokes simply break off small pieces, and attempts to whittle the substance will show still more plainly that the knife edge must be drawn lengthwise and not forced downward. It is on this principle that cork cutting machines are constructed. Steel mandrels, made hollow, with cutting edges like those of a shoemaker's punch, are made to revolve with great rapidity. Pieces of cork pressed against their cutting edges become almost immediately smooth perfect cylinders. These are placed in grooves on the circumference of a wheel which, working automatically, carries each cork to a point where its ends are received by a small lathe. The cork is then revolved slowly, while a large circular knife removes a thin shaving, thus giving it the necessary taper and a surface as true and smooth as if sand-papered. As fast as a cork is finished by the automatic lathe, it is released and another substituted in its place.

Some manufactories do not make use of the mandrel and automatic lathe as above described, but employ another form of machine which is much simpler in arrangement though less efficacious in action. It consists of a horizontal revolving knife of some two feet in diameter arranged on a frame with belting, etc. The workman, sitting in front of the machine, places one of the square bits of cork, which have been previously cut of the required size, into a revolving spindle by which it is firmly held. This spindle is raised a measured distance and the edges of the cork come in contact with the revolving knife, which pares them off, leaving the cork in a perfectly cylindrical form.

The operation is performed with great rapidity, the machine turning out some fifty gross per day. The size of the cork depends upon the distance the above mentioned spindle is raised, and the consequent quantity of the square piece which the revolving knife is permitted to remove. All sizes can be made on this machine, from the tiny stopper of the homœopathic vial, scarcely one quarter of an inch in diameter, to the four or five inch flat cork used to close jars of chemicals, etc.

The shavings made by these machines are all utilized—either as stuffing for cushions or life preservers, linings for refrigerators—cork being an excellent non-conductor of heat or cold—or for placing between floors or walls of buildings to deaden sound. Ground finely and mixed with india rubber, they also make a durable floor covering, resembling oil cloth.

The finished corks are sold by the gross, the present prices being 10 cents for the smaller vial sizes, $3 to $5 for the fine qualities used for closing champagne bottles, and from $10 to $12 for the extra large varieties. The use of machinery for this industry, introduced in this country in 1853, has proved a great saving of hand labor. It has been estimated that it would require 4,000 men to be continually at work to supply New York alone with corks, if all had to be made by hand. There are at present 60 manufactories in the country, cutting and supplying corks to the value of $2,250,000 yearly.

THE NEW RAILROAD BRIDGE AT ALBANY.

The largest double track iron bridge ever built in this country has recently been completed, and now spans the Hudson river between East Albany and Albany. The work was commenced on May 24th, 1870, and the first stone of the substructure was laid on the succeeding June 25th.

The main bridge is 1,525 feet long, and consists of seven spans over the basin, thirteen feet three inches each from center to center of piers; four fixed spans over the main channel, 185 feet each, and a draw 274 feet long, with two openings of 111 feet each in the clear. The curve of the bridge over the basin is on a radius of 710 feet. The main bridge is thirty feet above low water, and eight feet above high water mark, and is constructed on a vertical curve having a rise in the middle of fifteen inches. The whole length of the bridge, together with its approaches, including an embankment crossing Van Rensselaer island, on the east side of the river, is 2,250 feet, thus being equal to 4,500 feet of single track bridge. The abutments and piers are built on pile foundations, 160,000 yards of stone being used in their construction. The draw weighs 700,000 pounds and can be worked either by steam or by hand, the engine and boiler of ten horse power being located beneath the roadway.

The superstructure consists of 2,000 tuns of iron, mostly wrought, its trusses being twenty-six feet apart in the clear. The tension bars are made of double refined iron, and the fabric is calculated to stand a load of 6,000 pounds per lineal foot, exclusive of its own weight. The strain to which the bridge would be subjected under this load would not exceed one sixth of the breaking weight. It is estimated that the structure would sustain a continuous train of locomotives on each track, reaching from end to end of the bridge.

The entire cost of the structure was one million dollars. It is at present used for the crossing of freight trains and also for foot passengers, pathways on either side of the tracks being provided. The regular trains of the Hudson River road will not discontinue crossing the old bridge until the new depot in Albany, which has just been begun, is completed.

Messrs Bagley and Hilt, both well known bridge builders were entrusted with the supervision of the work, and Mr. Charles Hilton of Albany was engineer-in-chief.

Hints on Coloring Photographs.

The increasing demand for colored photographs, either as *cartes de visite*, stereoscopic enlargements, or slides for the magic lantern, opens a suitable field of labor for the educated of either sex: in fact, they are the only fit persons to undertake it, as it requires a lightness of touch not generally possessed by those accustomed to labor. But none can hope to succeed without some degree of talent, and who have had a sufficient practice in the use of colors to enable them to paint a tolerable picture without a copy, not a vile travesty of some chromo-lithograph, which is often the only practice afforded to school pupils. No particular box of colors, however prepared, will bridge over the want of experience.

Should any wish to follow this branch of art, let them color a prepared photograph to the best of their ability, and then show it to some respectable publisher, who will, no doubt, give an honest opinion on its merits; and should this be adverse, unless the time and expense of further practice can be conveniently spared, it would be better to lay aside the idea, otherwise time might be wasted, during which opportunities might be lost that might never again be offered.

The greasiness of the surface of albumenized paper offers some obstacle to the uninitiated, but this is easily overcome by adding a little prepared ox gall to the colors used, or even by passing the tongue over the surface. The greatest drawback I have found has been the difficulty of obtaining purity of tints in the half shades and reflections of the flesh, owing to the muddy brown color to which the print has been toned, a sort of smudge, which no transparent color can remedy. This, and the tendency of silver prints to become yellow by age, has often caused me to consider whether it might not be better, when they are especially prepared for coloring, to use some other process which would give more favorable tint for working upon. As I believe any variety of tint can be given in carbon printing, this, with its permanence, would point it out as the most preferable, but would, probably greatly increase the expense of a single copy only.

When oil colors are to be used, two or three coatings of weak size, made of gelatin, should be given to the print beforehand, and allowed to dry. As in water, transparent colors can be used, and the effect much improved by touching the high lights with opaque ones.

In portraiture, should the painter be sfficiently master of his art to paint a good picture in the usual way, he will find it much better to use the photograph as a copy than as a substratum.

Transparencies on glass must always receive a weak coat of varnish before coloring, otherwise dabbing in the skies will do injury to the impression.

It should be understood that there is a great difference between coloring—that is tinting—a photographic print and painting upon one; the former requires little more than tasty manipulation, the latter the skill of a well trained artist.

Retouching negatives also offers suitable employment, especially for female artists, as it requires light and delicate handling. I should think that an artist capable of retouching from the life—that is, taking sittings from customers—would be considered a desideratum in many photographic establishments, and be liberally remunerated.—*Photographic News.*

How the California Fields are Plowed.

The fields are plowed with what are called gang plows, which are simply four, six or eight plow shares fastened to a stout frame of wood. On the lighter soil, eight horses draw a seven gang plow, and one such team is counted on to put in 640 acres of wheat in the sowing season; or from eight to ten acres per day. Captain Gray, near Merced, has put in this season 4,000 acres with five such teams—his own land and his own teams. A seed sower is fastened in front of the plow. It scatters the seed, the plows cover it—and the work is done. The plow has no handles, and the plowman is, in fact, only a driver; he guides the team; the plows do their own work. It is easy work, and a smart boy, if his legs are equal to the walk, is as good a plow man as anybody—for the team turns the corners, and the plow is not handled at all. It is a striking sight to see ten eight horse teams following each other, over a vast plain, cutting "lands" a mile long, and when all have passed, leaving a track, forty feet wide, of plowed ground. On the heavier soil, the process is somewhat different. An eight horse team moves a four gang plow, and gets over about six acres per day. The seed is then sown by a machine which scatters it forty feet, and sows from seventy-five to one hundred acres in a day, and the ground is then harrowed and cross harrowed. When the farmer in this valley has done his winter sowing, he turns his teams and men into other ground, which he is to summer fallow. This he can do from the first of March to the middle of May; and by it he secures a remunerative crop for the following year, even if the season is dry. This discovery is of inestimable importance to the farmers on the drier parts of these great plains. Experience has now demonstrated conclusively that, if they plow their land in the spring, let it lie until the winter rains come on, then sow their wheat and harrow it in, they are sure of a crop; and the summer will have killed every weed beside.

How Summer Suits should be Washed.

Summer suits are nearly all made of white or buff linen, pique, cambric, or muslin, and the art of preserving the new appearance after washing is a matter of the greatest importance. Common washerwomen spoil everything with soda, and nothing is more frequent than to see the delicate tints of lawns and percales turned into dark blotches and muddy streaks by the ignorance and vandalism of a laundress. It is worth while for ladies to pay attention to this, and insist upon having their summer dresses washed according to the directions which they should be prepared to give their laundresses themselves. In the first place, the water should be tepid, the soap should not be allowed to touch the fabric; it should be washed and rinsed quick, turned upon the wrong side, and hung in the shade to dry, and when starched (in thin boiled but not boiling starch) should be folded in sheets or towels, and ironed upon the wrong side as soon as possible. But linen should be washed in water in which hay or a quart bag of bran has been boiled. This last will be found to answer for starch as well, and is excellent for print dresses of all kinds, but a handful of salt is very useful also to set the colors of light cambrics and dotted lawns: and a little ox gall will not only set but brighten yellow and purple tints, and has a good effect upon green.

Boiler Explosions.

Our esteemed correspondent, John Wise, of Philadelphia, Pa., in the course of a letter on this subject, makes the following communication:

"Why not make boilers egg-shaped? At all events, make them strong enough, as are made the big guns of warfare, so that they may bear, not double or treble their nominally guaranteed pressure, but strong enough, like Perkins', to bear a red heat, and then we shall no longer call for daily coroners' juries to inquest the steam boiler slain.

"It is seldom we hear of a steam chambered fire box explosion. And why? Because they are well braced and staybolted. Brace and staybolt the boiler, with equal precaution as to form and material as to its work and incidents, and then, and not until then, will explosions of steam boilers become rare."

AN exchange says: "Cleveland has invented a patent bug buster, worked with an air pump. All the apertures in a room are stopped but one, at which the deadly bug buster is placed. By exhausting the receiver, a current of air is produced strong enough to draw all the vermin out of the room, through the air pump, into the hopper, where they are put under the influence of chloroform, and stabbed in the back with a pitchfork."

WE regret to hear of the death of Dr. Perry Prettyman who was one of the pioneers of civilization in Oregon territory. He migrated thither in 1847, and continued to reside there till the day of his death, March 27, ult. His age was 76, and his life has been made useful to his country by many inventions and improvements.

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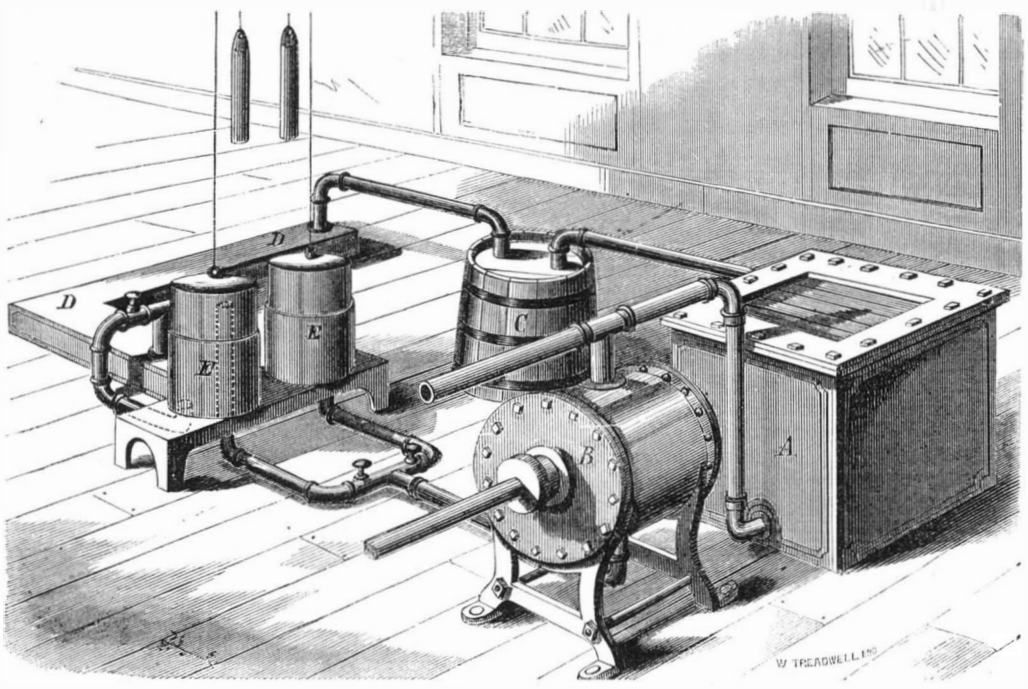
Improved Ice Machine.

The invention we illustrate consists of improvements in the method of, and machinery for, making ice by artificial means. At A is shown a tank, which is constructed of an outer chamber in which the freezing material is placed, and of an inner chamber to contain the water to be frozen. B is an air pump connected by a pipe with the freezing chamber in the tank; C is a vessel filled with oil or other hydrocarbon, into which the air from the freezing chamber is conveyed by a pipe from the upper part of the tank; D is a second oil vessel, which is connected by a pipe with the first; E E are two vessels having weighted covers; they are connected by pipes with the oil vessel, D, and also with the air pump, B, as shown in the engraving.

The freezing substance considered preferable is bisulphide of carbon, although ether, rhigoline, or chloroform, may be employed. The operation is as follows: The air is forced by the pump, B, into the freezing chamber in the tank, A. There it passes through the bisulphide of carbon and becomes surcharged with it, abstracting the requisite addition of heat from the water chamber. The heat and vapor of the bisulphide are then carried, with the air, into the oil vessels, C and D, where they are eliminated and the air purified. The purified air is thence conveyed to the vessels, E E, from which it is returned to the air pump by weighting their covers after closing the inlet cocks. The oil, when it has absorbed as much heat and bisulphide as is expedient, is drawn off and distilled, and the agent employed is re-obtained in its original quantity and purity. By the means described, the air is quite, or very nearly, restored to its original purity and temperature before it is carried back into the freezing liquid, and difficulties attending the use of other similar apparatus are thereby overcome. A further improvement in the process consists in depriving the air current of the aqueous vapor with which it is always more or less charged, and which forms frost and ice in the pipes; this is accomplished by passing the air over chloride of calcium placed in the bottom of the pipe leading from the pump to the freezing chamber. The invention was patented through the Scientific American Patent Agency by W. R. Johnston and W. Whitelaw, April 30, 1872. For further information, address the Whitelaw Ice Machine Company, Memphis, Tenn.

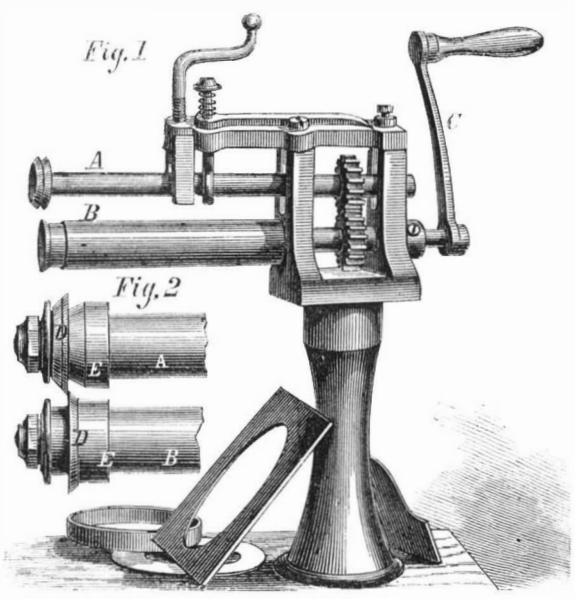


MACHINE FOR MAKING ICE.

BUNKER'S METAL CUTTER.

Our engraving illustrates a new machine for cutting metal with rotary knives, which is appropriate for tinners' use, and also for cutting iron that is too heavy for ordinary bench shears to act upon.

Fig. 1 shows the general arrangement, in which A and B



are two shafts which carry the cutters. The top one, A, is adjustable, by means of screws, to any required distance from the lower one. The two are geared together, as shown in the engraving, and turned by the handle, C. Fig. 2 shows enlarged views of the cutting and feeding apparatus attached to the ends of the shafts. The circular cutters, D D, overlap each other, so as to cut shear-fashion. Behind the cutters are rings or cylinders, E E, which press upon, and serve to feed, the metal to the cutters. The operation will be fully understood without further explanation. It is thought this machine will prove very useful for cutting off stovepipe, and for cutting out the holes for doors in stoves and furnaces. Several of the forms cut by it are shown at the foot of Fig. 1. Patented through the Scientific American Patent Agency, April 30, 1872. Further information can be obtained of the inventor, Mr. A. S. Bunker, 288 Common street, Lawrence, Mass.

Trial of Agricultural Implements.

The Ohio State Board of Agriculture have appointed a trial of agricultural implements and machines, to take place at Springfield, June 18, 1872. The following is a list of classes designated for competition, with the premium for the best of each description: Plow for general purposes, stubble plow, sod plow, double plow; premium in each case, a silver medal or $20. Subsoil plow, hill side plow, one horse plow, double shovel plow, a premium for each of a silver medal or $10. Steam plow, practical utility of operation to be fully demonstrated, $50; improvements in plows, diploma. Two horse grain drill, $40 and diploma; one horse grain drill, $10 and diploma; garden seed drill, $5; horse power corn planter, $20 and diploma; potato planter, $5; potato digger, $10; two horse corn cultivator, $20 and diploma; one horse corn cultivator, $10 and diploma; farm road scraper, $10; roller and crusher, $15; harrow, $10; mole or blind ditching machine, $20; post hole borer or digger, $5. In giving premiums on plows, the following points will be considered: Gross draft, weight, loss of power in overcoming friction, net power required to cut and turn the furrow slice, width of furrow slice, depth of furrow slice, comparative draft, simplicity of structure, materials, workmanship, durability, price, superiority of work. Competition is invited from all parts of the Union.

DURAND'S BURETTE.

This little appliance is the invention of M. Durand, of Saint Ouen, department of the Seine, France. Its operation will be readily understood on reference to the annexed illustration, in which *a* is the body of the can, *b* the long curved spout, and *c* c_1 a small tube in the form of a segment of a helical coil. This coil is affixed to the cover of the can and has one end, *c*, open to the air, and the other c_1, open to the inside of the can. In using the oil can when full of oil, all that is necessary is to cover the external aperture, *c*, with the thumb, which prevents any flow of oil from the spout, which is sufficiently small in diameter to prevent contrary currents. When it is desired to supply any lubricating reservoir, it suffices to uncover the aperture *c*, and thereupon the oil will flow in a small stream from the spout until the atmospheric pressure is again cut off from the interior of the oil can, after which no single drop will escape. This oil can is ingeniously simple and effective, and has been reported upon most favorably by a committee of the French Academy on Mechanical Arts.

Sea Weeds a Thousand Feet Long.

The Agassiz expedition, at the latest accounts, was off Sandy Point, Patagonia. Among the scientific curiosities noted by some members of the party were immense quantities of kelp, the *Macrocystis pyrifera*. This is the largest known *alga* or seaweed, and grows on these coasts in from six to twenty fathoms of water, in vast beds, warning the mariner to beware a near approach, unless he wishes to be entangled in an inextricable net work. It throws up from the oceanic depths stems of immense lengths, some of them from seven hundred to one thousand feet, the greatest development reached by any member of the vegetable race now in existence. Patches of this seaweed were passed in open sea, with large sea lions lying on its surface, who were apparently navigating in this novel manner with much satisfaction to themselves, and who afforded much amusement to their scientific observers.

False References.

A firm, hailing from Mississippi and purporting to be engaged in the business of selling patents under the style of Z. P. Dedrick & Co., are making unauthorized use of the name of Munn & Co. as a reference for their responsibility. Patentees will do well to keep clear of parties sailing under false colors.

To our Subscribers.

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A Simple Plan of Polishing Photographs.

Certainly a great number of my colleagues who have essayed the collodion and gelatin process for finishing photographs have met with many difficulties and uncertainties inherent to the method, and have, consequently, thrown it up; it was so with myself, and I went back again to an older plan of enamelling, which I had previously employed.

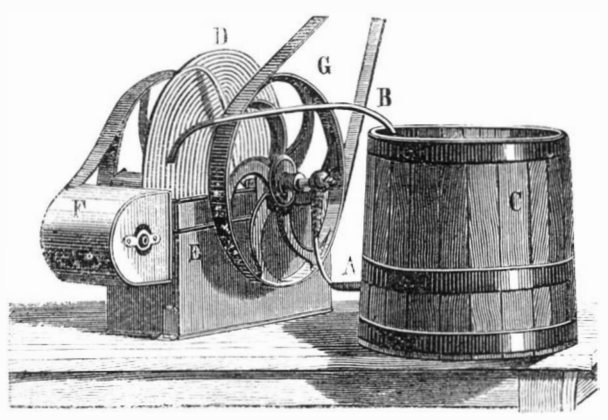
In the year 1865, I met with a photograph which had emanated from the studio of M. Dauthendey, of Wazburg, the picture being a bust with white oval margin upon a black ground. The photograph possessed a magnificent polish, and was of a very brilliant character; and experiments that I made with paper varnishes, etc., were all fruitless in giving the degree of finish possessed by the Dauthendey picture. Finally I came upon the following plan: I mounted about a dozen carte prints upon a card, covered them with a solution of gum—or, better still, gelatin—and when they had dried and been rolled and retouched, they were polished with a solution of white shellac in spirits of wine. This operation was conducted as if it was a question of furniture polishing, a rag being moistened with the liquid and rubbed to and fro over the prints for some time. The pictures, after standing the night, were again subjected to a second polishing.

Whenever the rag exhibited a tendency to stick to the surface, a minute quantity (say half a drop) of almond oil was applied to the photograph, and the operation of polishing continued. The photographs are subsequently cut out of the card. It is better to polish a number of small photographs at one time like this, as a large surface is more easily operated upon than a smaller one. The process is, probably, the same as that of M. Dauthendey, to be purchased for a honorarium of four florins.

The method, as already stated, is much to be preferred to the collodion and gelatin enameling process, so often recommended.—*C. Hoffman.*

DYNAMIC REFRIGERATOR.

Mr. J. B. Toselli, of Paris, France, has invented a cooling machine, which he calls the "Dynamic Refrigerator." It consists of a revolving disk, D, formed of a metallic tube bent into a complete spiral, having one end open, and with the other end communicating by a hollow shaft or axis of rotation with an external tube, A, communicating with a worm contained in a separate vessel, C, and terminating in a discharge pipe, B, with outlet into another vessel, E, containing the revolving disk, to which a slow movement of revolution is imparted by a driving pulley and belt, G, making, say, one turn in a second of time. The disk is half immersed in cold water, and as the exterior surface of the disk above water is continually wet, it exposes considerable evaporating surface. At the same time a continuous stream of water is forced through the hollow spiral, parting with some of its heat under the influence of the external evaporation and radiation, which is intensified by the addition of a ventilator, F.



The current being thus lowered in temperature, refrigerates in its turn the liquid to be cooled in the vessel, C. The lowering of temperature thus obtained varies according to the hygrometric condition of the atmosphere; the minimum effect obtained, under the most unfavorable circumstance, amounts only to a difference of 5° to 6° Fah., while the maximum difference obtained in sunlight is between 32° and 33° Fah.

This machine is obviously calculated to be of great service in many manufacturing processes—such as for brewing, distilling, and effervescent beverages—also in hydrotherapeutic establishments; and probably also on shipboard for the evaporation and distillation of sea water, and its conversion into a potable fluid.—*Mechanics' Magazine.*

ACOUSTIC EXPERIMENT.—Let a wide glass tube, open at both ends, be taken, and in this a piece of fine wire gauze be pushed up some little distance. If the gauze be now heated to redness, over an ordinary Bunsen burner, and then removed, it will shortly emit a shrill note, lasting from five to ten seconds. The experiment will be new to most of our readers, and has the merit of always going off.—*Journal of the Franklin Institute.*

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Contents:

(Illustrated articles are marked with an asterisk.)

American Inventions in Europe.. 400
Answers to Correspondents..... 401
Artists with Bad Eyes 392
A Simple Plan of Polishing Photographs..... 398
Boiler Explosions..... 397
Business and Personal..... 401
Corks and Cork Cutting..... 397
Death of James Gordon Bennett.. 400
Declined..... 402
*Dynamic Refrigerator..... 398
Expeditions to the North Pole.... 392
False References..... 398
From the Atlantic to the Pacific.. 392
Gathering Nicaragua Caoutchouc 393
*Gunpowder Pressure Gages..... 394
Hints on Coloring Photographs... 397
How Paper Collars are Made..... 400
How Summer Suits should be Washed..... 397
How the California Fields are Plowed..... 397
*Improved Burette..... 398
*Improved Coffee and Grain Dryer 391
*Improved Ice Machine..... 398
*Improved Metal Cutter..... 398
*Improved Pestle for Hulling Coffee, Rice, etc..... 391
Inventions Patented in England by Americans..... 402
Iron Ship Building in Wilmington 399
Mesquite Gum..... 393
Meteorites, their Origin..... 399
Nature of the Action in Galvanic Batteries.. 393
*New Device for Railway Signals 395
Notes and Queries..... 401
Novel Method of Indicating a Hot Journal..... 396
Official List of Patents..... 403
*On Ice, Water, Vapor and Air.... 394
Petroleum and Coal..... 396
Preservation of Grain in Vacuo... 393
Recent American and Foreign Patents..... 402
Sea Sickness..... 396
Sea Weeds a Thousand Feet Long 398
Scientific and Practical Information..... 401
Solvent for Coralline..... 391
Swiss School of Milk Production and Management..... 393
Telegraphy without Insulation... 396
The Air we Breathe 393
The Eight Hours Strike in New York..... 399
The Hartford Steam Boiler Inspection and Insurance Company.. 392
The New Railroad Bridge at Albany..... 397
The Pneumatic Railway Brake and other Applications of the Pneumatic System..... 399
The Rubber Tip Pencil Case..... 396
To our Subscribers..... 398
The Sign Boards of New York.... 400
Trial of Agricultural Implements 398
*Vertical Balance Galvanometer. 395
Vitrified Marble..... 396

METEORITES, THEIR ORIGIN.

It is a most curious but, notwithstanding this, a well established fact that sometimes stones fall from the sky, and formerly the most absurd hypotheses were invented to explain their formation, in the upper strata of our atmosphere, by the condensation of vapors of solids, as hailstones are formed by the congelation of the vapor of water. Towards the end of the former century, La Place sought their origin at a greater distance; he concluded that as gravitation on the moon is some four times smaller than on the earth, it might be possible that the volcanoes there could propel stones with such a force as to go beyond the limits of lunar attraction into the sphere of terrestrial gravitation, as a velocity double or triple that which we can give to a cannon ball would be sufficient to accomplish this result; this hypothesis was accepted for a time, notwithstanding the objection of astronomers and chemists, the former proving that the observed velocity of the bodies and the force with which they strike the earth were much greater than they could possibly obtain from a source so near as the moon; in fact, astronomers proved that aerolites possess a planetary velocity. Chemists, from their side, pointed out that the chemical composition of aerolites was by no means that of matters ejected from volcanoes, but that they were compounds of metals, as found in earth, but combined in a way different from any terrestrial mineral known; in fact, that the greater number of aerolites were imperfectly mixed alloys of iron and nickel, with 4 to 14 per cent of phosphorus, the iron being on the average present in the quantity of 60, the nickel of 21, per cent. Chladni, in the beginning of this century, founded his theory in regard to the origin of the aerolites on the opinion of Kepler, who maintained that there were more comets and smaller bodies of different kinds flying about in space than fishes in the ocean. Chladni's theory was that, in the interplanetary and interstellar spaces, small masses of solid matter are moving about in countless numbers, either in regular or irregular orbits, and that when they happen to come within the sphere of gravitating attraction of any planet, they will fall towards the surface with a velocity the resultant of their own planetary velocity *plus* the newly acquired velocity of gravitation, *minus* the resistance of the air which surrounds the planet. On reaching its surface, these velocities are destroyed, and the necessary consequence is the evolution of heat, this being nothing but molecular motion, the metamorphosis of mass motion when the latter is forcibly prevented from continuing. This accounts for the heat of the masses when picked up immediately after their fall, while the train of fire exhibited in many instances is easily explained by the consideration that they originally may contain combustible substances which had no chance to burn in the highly rarefied interplanetary medium; but, coming in contact with the oxygen in our more dense atmosphere, and that with the immense planetary velocity, the friction, combined with chemical action, raised the temperature rapidly to the point of combustion.

The latest theory in regard to their origin is that of Proctor, in England. It is based on the recent investigations of the solar atmosphere by means of the spectroscope and telescope, which show that continually the most gigantic eruptions take place in the solar surface, throwing up gaseous matter containing iron vapor, etc., at an initial velocity of more than 500 miles per second to a hight of over 200,000 miles. Proctor thinks that if any denser material is ejected from the bowels of the sun by these explosions, it will never return to the sun again, and will fly off into space, revolve for some time around some planet, and finally descend on the same, as the meteors do on earth. If this view be correct, the specimens of meteoric iron preserved in our cabinets are pieces of the sun.

If we take in account that the spectroscope shows that the most prominent substance in the sun is iron, and that the same is the case in the meteorites, that they are combined chiefly with nickel, another metal found in the sun, forming an ally not found on earth: that they also show a peculiar crystalization, and in general a common origin, the view is by no means so improbable, however startling it may be; it is moreover sustained by the unanimous testimony of all modern observers, who affirm that the solar eruptions surpass in immensity any volcanic eruption which ever takes place on earth, or which, in past ages, must have taken place on the moon.

THE EIGHT HOUR STRIKE IN NEW YORK.

The progress of the eight hour movement here, which until recently appeared successful, has encountered a check which bids fair to result in defeat. Elated by the easy victories gained over the smaller employers, the strikers have carried the war to the doors of the great manufacturing firms and corporations. But here a strong opposition has been encountered. Hitherto the action of the strikers has been characterized by but few breaches of the law, and the public has been led to believe that the revolution might be effected without the usual recourse to riot and violence. This in the beginning was the opinion held by us, but the late reports of the new position taken by the workmen indicates that our city is likely to be disgraced by acts of lawlessness.

This eight hour movement affects every working man in the land, and unless all or a very large majority of the laboring classes afford it an unwavering support, the accomplishment of its design is impracticable. This encouragement from other localities has not, with the exception of a few trifling instances, been accorded. The leaders of the uprising are fully aware of this fact, and, stung by disappointment and at the same time forced to contend against unlooked-for and powerful resistance, they rush desperately to the last extremes, and endeavor, by threats of personal violence, incendiary documents, and other methods of brutal intimidation, to enforce the ends which they have failed to accomplish by peaceful measures.

We marvel that any sensible mechanic can lend himself to such proceedings and virtually take the bread from the mouths of his family or devote the little sum he has laid aside for a rainy day to the furtherance of such principles.

Organized gangs of malcontents have of late infested the surroundings of our large manufactories, seeking to induce the operatives, by persuasion or argument, to join their ranks. Now, however, their policy seems to have changed, and with the utmost audacity they enter the buildings, spread through the shops, and compel the workmen, who may be perfectly satisfied with their hours and their wages, to abandon their labor; and this in direct contempt of the remonstrance of the manufacturer or corporation on whose premises they may be trespassing. The hands having been enticed away or forced to quit work, the next proceeding is a declaration of terms on the part of the League to the employer, coupled with the information that, under no other circumstances save a compliance with the demands therein set forth, will he be permitted to continue his business.

The outrageous nature of these claims is illustrated by the following requisitions made to Mr. J. G. Batterson, the builder of the Masonic Temple on the corner of 23d street and Sixth avenue in this city, and communicated by him to the *Hartford Times*. Mr. Batterson had last fall resisted the strike at his quarry at Westerly, R. I. and has continued to cut granite under the system hitherto maintained, with a certain number of apprentices and last year's rate of wages. He carried that through successively and is now met by the stone cutters in New York with a declaration that he can only be permitted to carry on business in this city by complying with the following exactions: 1st. He must *throw away* all the cut stone which has been wrought during the past six or eight months by "non-society" men and apprentices—amounting to about twenty-five thousand dollars in value—and have it all done anew out of new stone by "union" or "society" men. 2nd. He must reimburse the various trades' unions who contributed money to support the striking workmen in the Westerly quarries, or, in other words, he must pay them all they expended in the attempt to break him down. 3d. He must dismiss all apprentices and recognize the power of all trades' unions. Extra emphasis was given to these requirements by the smashing of various ornamental parts of the cut stone about the building. Mr. Batterson refused acquiescence, appealed to the police for protection—and also continued work with men from his quarries at Westerly.

The detail of a force of police to insure the security of the Masonic Temple and also to protect other threatened points called forth the memorial from the League to the Governor, which, as a specimen of matchless effrontery and insolence, we have never seen rivaled. Like the Southern confederacy, the strikers wish to be "let alone," and they protest against the unwarrantable interference of the police in their peaceful occupations of closing factories, threatening employers, and offering personal abuse and violence to workmen who refuse to agree to their wishes.

We sincerely trust that the Government, both municipal and State, will invoke the full power of the law to repress and punish every act of violence these men may attempt. Ample protection is due to every workman who wishes to continue his labor at old rates; the entrance of committees and delegations into factories should be prevented, and any riotous movement should be crushed with a promptness and severity that would teach these organizations, and bring home to the minds of trades' unions generally, the fact that the use of violence as a means of coercion is beyond their powers, and that irresponsible associations, however numerically great, have no more authority than single individuals to abridge or violate the rights of the citizen.

THE PNEUMATIC RAILWAY BRAKE AND OTHER APPLICATIONS OF THE PNEUMATIC SYSTEM.

The pneumatic railway brake, or Westinghouse brake, which for several years past has been so successfully used on the principal railways in this country, is now attracting great attention in England, where it is considered a remarkable improvement. It is the invention of Mr. George Westinghouse, Jr., of Pittsburgh, Pa. It is used on twenty thousand miles of railway here. It has lately been adopted on the Caledonian railway of Scotland, a first class company. A locomotive and train of six cars has also been recently fitted with it on the St. Albans branch of the London and Northwestern railway, and on both of the above roads the invention has been subjected to the severest practical tests. The train, running at a velocity of 50 miles per hour on a level, was stopped in 16 seconds after turning the air on, within a distance of 260 yards. On a down grade of 1 in 68, train running 60 miles per hour, the stop was made in 23 seconds, within a distance of 308 yards.

The invention, it will be remembered, consists in having an air reservoir placed under the locomotive, in which reservoir a supply of compressed air is maintained by a steam pump. The compressed air is conducted, through lines of double pipes, to a series of air cylinders or engines, one of which is placed under each car for the purpose of working the brakes. In order to apply the brakes, the engineer simply turns a cock which admits air to all the brake engines in the train at once. Nothing could be more effective or convenient. An air pressure of 70 lbs. to the square inch is maintained in the reservoir.

The practical applications of the pneumatic system are becoming yearly more and more various and extended. In London, there are now in operation some nine miles of pneumatic tubes, for the conveyance of letters, etc., under the surface of the streets. For some ten or twelve years, passenger trains were regularly operated on one of the Parisian railways by the pneumatic plan, while in Great Britain, during a series of practical trials with the same system, passenger cars were propelled at a velocity as high as sixty miles per hour. It is true that this method of propulsion has not yet been reduced to the same point of economy that is realized with the steam locomotive; but there are situations where the employment of steam is for special reasons so undesirable that even at an increased expense, a good substitute becomes necessary. As for example, for city railroads, the pneumatic plan, which furnishes rapid speed and pure air, is decidedly preferable to a steam road, which whether placed above or below ground is more or less of a nuisance to everybody.

Another important application of the pneumatic system relates to rock drilling, and is now very extensively employed for that purpose. It was used in the boring of the great railway tunnel through the Alps. It is also employed at the tunnel now being bored through the Hoosac mountains, Massachusetts, which, next to the Alpine tunnel, is the largest work of the kind. The pneumatic drills are also used in boring the net-work of tunnels under the East river, at Astoria, N. Y. In all of these examples a pneumatic pressure of about 60 lbs. to the square inch is used.

Another very beautiful and successful application of the pneumatic system is employed in the construction of the foundations of bridges under water. The great bridge over the Mississippi at St. Louis is an example, the foundations of which were carried down, one hundred and thirty-six feet below the level of the water, by the maintenance of a pneumatic pressure within the caissons of some fifty-two pounds to the square inch. The same system was employed here in the sinking of the foundations of the Brooklyn suspension bridge.

IRON SHIP BUILDING IN WILMINGTON.

Among our maritime manufacturing cities, Wilmington, Del., must now be held to take a very prominent position. During the last eight or nine years, the energies of her capitalists have been directed to iron shipbuilding, and great success has resulted from their efforts.

The city is naturally well situated for shipbuilding purposes, and the facilities for obtaining iron are unexcelled. Two railroad lines extend to the mining regions of Pennsylvania, and the ore is brought by them directly to the shipyards. The latter are all located on the Christiana Creek—a wide and deep stream which forms a junction with the Delaware River at Chester, Pa. Adjacent to Hollingsworth and Harlan's yard is a large dry dock, only rivalled by that at the Brooklyn navy yard, which has just been completed by that firm at a cost of $125,000. The basin is of solid granite, built in terraces. The above firm alone employs 700 mechanics, and another, 500; the whole number employed by the various builders is, according to a correspondent of the *Evening Post*, about 3,000, which is rapidly on the increase with the extending business. The builders

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roll their own iron plates and manufacture everything pertaining to an iron vessel themselves. Many magnificent steamers have been built at this yard, the workmanship of which would bear comparison with that of the finest Clyde-built vessels. There are now on the ways a vessel of 3,000 tuns intended for the Pacific Mail Steamship Company, and one of 1,500 tuns for the Cromwell line. At the yard of Pusey and Jones, over sixty iron vessels for different lines have been built during the last seven years, and at present they have on the ways a 3,000 tun ship for the South American trade.

The business of the other builders is also in a flourishing condition, and there is every prospect of Wilmington becoming the great center, on our continent, of this branch of industry.

HOW PAPER COLLARS ARE MADE.

One hundred and fifty million paper collars, it has been estimated, are yearly used in the United States; and statistics show that even this immense number is steadily increasing as improvements in the manufacture multiply.

The collars are made in two varieties: of paper and cloth combined and of paper alone. The best materials are used in the manufacture of the paper. It is supplied in heavy white sheets, sixteen by thirty-six inches in dimensions, weighing 125 pounds to the ream. On being received in the manufactory, it is sent to the enameling room, where each sheet is covered with a thin layer of enamel and then placed on racks heated by steam pipes until thoroughly dry. This work is performed entirely by hand, and the enamel mixture applied with an ordinary brush.

After the sheets have become thoroughly dry, they are embossed to imitate cloth. To produce this effect, muslin is tightly stretched and pasted on plates of tin corresponding in size to the sheets of paper. Between pairs of plates thus prepared, the paper is laid, about fourteen sheets at a time being thus arranged, making a pile of alternate layers of paper and tin. The whole is then passed between heavy steel rollers, the pressure being sufficient to imprint the threads of the cloth on the paper, so that a perfect *fac simile* is thus obtained.

Each sheet is then polished by passing it over swiftly revolving brushes, when it is ready to be transformed into collars. The paper is next sent to the finishing loft, where, by means of movable dies made of steel, with edges sharpened so as to penetrate the material readily, the collars are cut out. A heap of sheets, about eighty in number, is arranged under a press, the die placed upon them, and the press set in motion. A single stroke cuts through the paper, and the collars are shaped. They are now perfectly flat, destitute of button holes, and, besides, must be molded before they are ready for packing.

At one end of the loft are large rolls of starched muslin, the use of which it is at first somewhat difficult to divine. A glance at the next process through which the collars pass soon affords an explanation, for the muslin is seen cut up into little elliptical bits called "patches" which are pasted on the extremities and middle of the collar. Their object is to give the button holes the necessary strength and to prevent them tearing out when soaked by perspiration. A very ingenious machine puts on these patches, cuts the button holes, impresses the imitation of stitches on the borders, folds the collar, and stamps its size on it, all in one motion.

The collars, as fast as they are finished by this machine, are bent or molded so as to fit the neck. The molding apparatus accomplishes its work with astonishing quickness, although it may be fairly considered as rivalled in rapidity of motion by the girls who pack the collars in the boxes. A bundle of a dozen is made up and twisted into its receptacle as if by magic, each girl packing some 20,000 collars per day. The last process is to label the boxes, place them in cases, and the goods are ready for the market.

The cloth lined collars are the more expensive of the two varieties. They are made of paper to which muslin, either white or colored, is firmly pasted, so that no embossing is necessary, and are cut out and finished in the same manner as above described. Cuffs and false shirt bosoms go through the same processes, dies being used of the required forms. This manufacture is largely carried on in this city.

AMERICAN INVENTIONS IN EUROPE.

Several American improvements of a valuable character are now attracting public attention in England and on the Continent. One of these is the Danks puddling furnace, by means whereof mechanism is successfully substituted for manual labor in the production of puddled iron. This is the invention of Samuel Danks, of Cincinnati, Ohio, and its introduction is acknowledged by the iron masters of England to have effected a revolution in the puddling business. It reduces the cost of making the iron at least five dollars per tun. Another improvement is the Henderson process of making iron and steel, the invention of James Henderson, of New York city. The object is to remove the phosphorous and other impurities from the pig iron, and convert it into fine wrought iron or steel at one operation without either mechanical or manual puddling. This is accomplished by melting the iron in connection with fluor spar, ilmenite, and manganese. Some very remarkable results have been obtained. At a trial at the Blockhairn ironworks, Glasgow, pig iron containing 1·14 per cent of phosphorus was melted, and in 50 minutes after fusion only ·12 of phosphorus remained, and in the finished wrought iron, only ·07.

Another invention is the pneumatic railway brake of George Westinghouse, Jr., of Pittsburgh, Pa., already in extensive use in this country, but now just being introduced abroad. In this improvement, the brakes are operated by compressed air, supplied from a reservoir placed under the locomotive, a special pump being employed to effect the compression. The practical results obtained in England are considered remarkable by the railway authorities there.

THE SIGN BOARDS OF NEW YORK.

New York presents on her sign boards and in her streets a large series of odd combinations of letters, more *bizarreries* in color, form, and design, and probably a greater number of ingenious advertising dodges, than any other city in the world. Among the many of these striking devices which sometimes ornament, often disfigure, the fronts of the buildings on the great thoroughfares, the sign emblematical of the business pursued, though one of the oldest, seems to be one of the most popular modes of arresting public attention, and its manufacture is made a specialty by several well known firms. Broadway is prolific in odd conceits in this class of sign. A depot for homœopathic preparations displays, on its front, a huge white pellet; colossal gilded pipes are suspended over the doors of vendors of meerschaums, and the most prominent of all is an immense gilt eagle which, holding a basket in its beak and perched on the edge of a roof, is visible the whole length of the street, serving to advertise a manufactory of willow ware.

We miss the impossible counterfeit of the noble red man, for so long the favorite symbol of the tobacconist. Fashion has banished him from the aristocratic marts of Broadway to the less pretentious shops on the avenues; but his place is filled by elegantly painted images representing goddesses of liberty, base ball players, gorgeously attired damsels, or perhaps simply by the upper half of a smiling individual who, placed in the window, seductively beckons us to enter. These effigies carved from wood exhibit much artistic skill both in coloring and in model. A large proportion of them are made across the river, in Brooklyn; their cost is from fifty to two hundred and fifty dollars each. A leading hat firm decorates the roof of its store with a wooden bear: importers of toys favor figures of Santa Claus, and a speculator in dollar jewelry, on the Bowery, displays a banner on which an admirable representation of a one dollar greenback is painted.

New and odd conceits in trade mark signs make their appearance almost daily, those of the umbrella manufacturers being especially ingenious. One of the most striking is a representation of a philosophic individual, calmly seated, holding over his head an umbrella on which a youth pours buckets of water, the latter being furnished him by a third party who is represented as frantically pumping. Another firm in the same business symbolizes its trade by the picture of a South American guanaco, and obtains a still better advertisement by philanthropically distributing white sun umbrellas, on which the name of the manufacturer is printed in large letters, among the stage drivers and cartmen. In many instances, signs are made to advertise a business and at the same time prove valuable as public conveniences. Handsome clocks, surmounting iron columns placed on the sidewalk, are found in many parts of the city, bearing the names of jewelers. A safe manufacturer places an enormous wind vane, on one end which his advertisement is inscribed, on the edge of his roof so that it can be readily seen from the street, and a maker of optical instruments takes advantage of the popular curiosity as to the temperature of the weather by exposing his sign attached to a large thermometer.

Queer conceits abound, the very oddity of which makes them noticeable. An entire building in Broadway is constructed of iron after a Moorish style of architecture, and is painted and stencilled in patterns of every hue in the rainbow. The tea stores in Vesey street color their fronts bright vermilion and green, and ornament their interiors with Chinese lanterns and frescoes depicting scenes in celestial life. Signs with the letters upside down are often used, and sometimes the characters are so intermixed as to require some puzzling to decipher their meaning. A window glass manufacturer arranges the letters of his sign thus "W G I L N A D S O S W." Those pests of Broadway, the peripatetic individuals who carry banners, have happily been abolished, but their places are taken by others, who, dressed in ridiculous costumes, endeavor to force circulars into the hands of passers. Helmbold the druggist, before his failure, placed on the roof of his building the mast of a ship, fully rigged with yards, gaff, boom, etc. Each yard arm was decorated with a flag, and a huge burgee with the name "Daunter" floated from the mast head. A warlike effect was given to the whole by showing the muzzles of two "quaker" cannon protruding from the cornice.

One of the most ingenious devices was that of a photographer on Broadway. An automatic stuffed monkey was represented as taking the likeness of a female of his own species. The figures were ludicrously dressed and, by means of clockwork, made to go through various motions in a very natural manner. The sitter poses herself, the operator inserts the plate in his miniature camera and turns away as if waiting; after a short pause, he removes the plate, bows to the lady, who turns her head, adjusts her dress, etc., and the same performance is repeated.

A printer in Center street displays an effigy of a Chinaman who, worked by machinery in the inside of the building, assiduously turns a wheel on which the sign is inscribed. The fence surrounding the new Post Office contains the advertisement of a western railway, which is embellished by the stuffed head of a huge buffalo, said to have been killed by Prince Alexis. Carts driven around the city, covered with posters and gaily painted transparencies are not so common as formerly; their advent when they are used is generally quite forcibly announced to every body far and near by the continuous tolling of what is known as the "Tammany" bell. An enterprising individual recently caused considerable astonishment and not a little trepidation among the pedestrians on Broadway by leading a full grown lioness down the street. His advertisement was gaily painted on a cloth which was thrown over the animal's back.

The stereopticon and electric light have lately been employed for night advertising. By means of the former, pictures and business cards are alternately thrown on a large screen, the exhibition always attracting a crowd of spectators. The electric light is used to flash suddenly on the sign to which it is desired to draw attention. Very attractive signs for night use are those made from prisms or cut crystals and glass. The latter are imported from Prussia and set in frames of galvanized iron wire, made in the required shape. Inside the frame are placed revolving gaslights which produce, when seen from the exterior, a dazzling effect. A new way lately introduced of manufacturing these signs is to make the frame of cast iron and set in glass bulls' eyes of different colors. They cost from fifty to one thousand dollars, the price depending on the size. Cups of colored glass, each containing a gas jet and arranged in the form of letters, devices, etc., are also used for illuminated advertisements.

There are not many novelties of late invention in sign making. A heavy wire network on which are fastened large wooden letters is being introduced as a roof sign. Block letters made of sheet brass and nailed to the sign board have lately come into the market and present an effective appearance. For smaller placards, mirrors are very handsome. The design is traced on the back by removing portions of the amalgam, and made prominent by the glass being placed against gilt or colored paper. In banners, those made from network, with strips of canvas on which the sign is painted fastened upon them, have superseded the large pieces of canvas. The former are lighter and much more durable, as they are not apt to blow to pieces in a high wind.

DEATH OF JAMES GORDON BENNETT.

Among the prominent men recently deceased is James Gordon Bennett, founder and proprietor of the New York *Herald*, aged 75. So far as concerns the ethics of journalism, he was unscrupulous and irregular, zealously advocating the cause of truth and justice on one day, but perhaps the very next day assailing the same cause with unworthy vehemence. Editorially regarded, the *Herald*, under Mr. Bennett's *régime*, was notoriously unreliable; but as a vehicle of news it was the embodiment of enterprise, and in this respect it outranked all its competitors of the press. The New York *Herald* is one of the most widely circulated daily papers in the world, and as a property one of the most valuable. The establishment falls, by the bequest of its founder, to his only son, Mr. James Gordon Bennett, Jr. He is a young man of about 26 years, of considerable physical activity, chiefly famous as a sportsman, particularly in the yacht line. No king upon his throne ever possessed such power for good or evil as that now wielded by young Mr. Bennett in the New York *Herald*. That he may use his great inheritance honorably and wisely is the earnest wish of every person in this community.

QUICK MAILS.—The largely increased mails to be carried from Chicago to New York have induced the managers of railways to put on mail trains proper, each to consist of one locomotive and three mail cars, to be run through in twenty-four hours. Several cars are now building for this purpose, each fifty feet long and adapted for fast running. No stoppages are to be made except for coal and water, and it is intended that the distance (962 miles) shall be accomplished in the time stated, which would be running over forty miles an hour. Some such measures seem to be imperative, and will be attempted, at any rate, to relieve the Chicago and New York city post offices of an embarrassing glut of mail matter growing greater from month to month.

IMPROVEMENT IN FRACTIONAL DISTILLATION.—Linnemann has successfully applied to laboratory purposes the principles of a method largely used in the arts, in the construction of the so-called dephlegmators. This principle consists in partially condensing locally the vapor which rises from a boiling liquid, in such a manner that the vapors which subsequently rise shall pass through the condensed liquid, and thus in a certain measure be washed. The apparatus employed consists simply of a vertical tube, attached to the flask in which the liquid boils, and containing six or eight little caps of platinum wire gauze separated from each other by small intervals.

DR. JOULE, in some experiments lately made on the polarization, by frictional electricity, of platinum plates, has found that charge which they received was only diminished one half after an interval of an hour and a quarter. The plates were either immersed in water or were laid in alternate series, separated by wet silk. The amount of charge they took was measured by means of a delicate galvanometer. He has suggested that a condenser on this principle might be useful in researches on atmospheric electricity.

MILK OF DISEASED CATTLE.—Mr. Husson, in a paper upon the milk of animals diseased with the cattle plague, announces, as the result of one of his researches, that neither the flesh nor the milk of animals suffering from this cattle plague —contagious typhus—will convey the disease, although they may suffer greatly in their nutritive properties. The milk of diseased cows he found to have a more or less marked reddish yellow tinge, and a disagreeable flavor, although cats fed upon it seemed to suffer no inconvenience.

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SCIENTIFIC AND PRACTICAL INFORMATION.

NEW METHOD OF MAKING BORAX.

When an alkaline sulphuret is added to an aqueous solution of boracic acid, the water is decomposed; the hydrogen, replacing the metal, forms sulphuretted hydrogen, while the oxygen goes to the metal to form a base, which then combines with the boracic acid thus:

$$SNa+2BoO_3+HO=HS+NaO, 2BoO_3.$$

This property may be used in the manufacture of borax from boracic acid. The carbonate of soda heretofore used for this purpose is much more expensive than the sulphuret, since in the manufacture of soda the sulphate is first reduced to the sulphuret which is afterwards converted into the carbonate. By making use of the sulphuret instead of the carbonate, this last and difficult step of the operation is dispensed with. The sulphuretted hydrogen given off may be either employed in the manufacture of sulphuric acid, it being converted into sulphurous acid by burning, or the sulphur itself may be obtained from it by bringing it into contact with sulphurous acid.

LIQUID LENSES.

A new and beautiful lecture experiment has been adopted by Professor Henry Morton, which illustrates very forcibly the action of refraction. A magic lantern is arranged vertically in connection with suitable mirrors to throw the image upon the screen. An empty watch glass is substituted for the usual objective lens. If now we introduce an object, as for example a photograph on glass of course no image will be produced on the screen, but only a nebulous patch of light. On pouring water into the watch glass, however, a well defined image is produced. On replacing the water by alcohol, muriate of tin, or other more highly refracting liquid, a lens of higher power is obtained.

HOUSE BUILDING.

A paper on this subject, read by Edward Roberts, F.S.A., before the Royal Institute of British Architects, closes as follows:

1. Never allow pervious drains in pervious soil.
2. Never allow a cesspool or drain near a well.
3. Never select gravel as a building site if well drained clay can be obtained.
4. Never allow drinking water to be drawn from a cistern supplying a water closet.
5. Never allow waste pipes to be inserted into water closet traps.
6. Never allow rain water to run to the ground, if it is required above.
7. Never allow water to stand in pipes exposed to frost.
8. Never allow pipes to be fixed so that they cannot empty themselves.
9. Never ventilate except by pipes or tubes, inlets and outlets being of equal size.
10. Never use glazed earthenware pipes for upward flues.
11. Never allow chandeliers to be the exclusive light, merely because it has been customary.

INDUSTRIAL EXHIBITION AT NEWARK, N. J.

Arrangements are now being completed for holding an exhibition at Newark, N. J., in August next. The specimens exhibited will be classified as follows: (1) Fine Arts and Education, (2) Dwellings, (3) Dress and Handicrafts, (4) Chemistry and Mineralogy, (5) Engines and Machinery, (6) Intercommunication, (7) Agriculture and Horticulture, (8) Tools and Hardware. No premiums or anything in lieu thereof are to be awarded to exhibitors, and the merits of their productions will thus be pronounced upon by the public solely and wholly. Messrs. Marcus L. Ward, A. M. Holbrook, and Isaac Gaston are respectively the President, Secretary, and Treasurer of the exhibition.

A farmer in Connecticut is said to have contrived an infernal machine for the destruction of crows, in the shape of a kernel of corn which explodes on being picked up by the unsuspecting bird, and blows his "durned eturnul head off" without the slightest warning.

Facts for the Ladies.—Louisa Kelley, Ackworth, Ga., has, with the general use of a Wheeler & Wilson Lock-Stitch Sewing Machine, for three years supported a family of four adults and two children, built and paid for a house, and has $100 cash on hand. See the new improvements and Woods Lock-Stitch Ripper.

Burnett's Cocoaine gives luxuriance to the hair.

The People's Friend.—It is susceptible of easy proof that the Sewing Machine has been a greater blessing to the masses of American people than any invention of the present century. Nothing else has done so much to save the lives and health of the wives and mothers, the patient, overworked women of the land, who, as a class, most needed relief from the burthens of everyday life. Every father and husband fails in his duty if he neglects to endow his home with such a triumph of science as the Wilson Under-Feed Sewing Machine. It is the cheapest and best sewing machine ever offered. Salesroom, 707 Broadway, N.Y.; also for sale in all other cities in the U.S.

Business and Personal.

The Charge for Insertion under this head is One Dollar a Line. If the Notices exceed Four Lines, One Dollar and a Half per Line will be charged.

The paper that meets the eye of manufacturers throughout the United States—Boston Bulletin, $4 00 a year. Advertisements 17c. a line.

Wanted—Situation as Book-keeper in some good manufacturing business. Can invest means, if satisfactory. C. S. B., Box 929, Cincinnati, Ohio.

Drying Glue—Wanted an artificial, economical, rapid process, in all weather. Address Glue, P. O. Box 6763, New York.

Rapid Evaporator—Simple, 6 ft. sq., no pumps, no attendance, evaporates 4 gals. a min. at temp. under 175°. Address P. O. Box 6763, N.Y.

Wanted—A first class Sewing Machine Repairer. T. Shanks, Baltimore, Md.

Galvanized Slating Nails, Stove Reservoirs, and Hollow Ware. Address Cleveland Galvanizing Works, Cleveland, Ohio.

Machinery Paint, all shades. Will dry with a fine gloss as soon as put on. $1 to $1.50 per gal. New York City Oil Company, Sole Agents, 116 Maiden Lane.

Second hand Iron Planer, to plane 9 feet long, 33 inches wide—good as new and cheap. Chas. Place & Co., 60 Vesey St., New York.

Wanted—A party to make a wood workers' cast iron vise on royalty for the N. E., Middle and Southern States. No expensive machine work necessary. Crawley & Baylies, Edgartown, Mass.

Moulds for Casting Soft Metals made to order. Die sinking the same. We will take a few small articles to manufacture. Send models and patterns. Guns reamed to order. Waterman & Co., West Meriden, Ct.

A steady mechanic, having some knowledge of pattern-making, wishes to perfect himself in that branch at some good shop in or near this city. Plenty of tools. Wages not an object. Address G. McNamara, 142 Nassau Street, New York.

Wanted—A Good Brass Moulder. A "steady" man can find constant employment by applying to Jas. Flower & Brothers, Detroit, Mich.

Wants to Buy one 4 foot Plane and one 4 foot Screw Cutting Lathe. Defiance Machine Works, Defiance, Ohio.

For Sale—Goodyears' Patent Hub Machine. Will turn 100 Sets Wagon Hubs per day. Defiance Machine Works, Defiance, Ohio.

Wanted—A partner in the Machinist and Foundry business, well established at Minneapolis, Minn. Address Chas. M. Hardenbergh.

Portable Baths. Address Portable Bath Co., Sag Harbor, N.Y.

Verdi Water Mills for Sale, with 400 acres of Land. Address J. A. Beam, Verdi, Kans.

Nickel Plating with or without Battery. Instructions of plating with new and unsurpassed solutions given on moderate terms by a practical plater. Address John Nagel, 83 East 7th Street, New York.

Standard Twist Drills, every size, in lots from one drill to 10,000, at ⅓ manufacturer's price. Sample and circular mailed for 25c. Hamilton E. Towle, 176 Broadway, New York.

The Shive Steam Engine Governor—Guaranteed to be the best in the world. Circulars sent free. Shive Governor Company, 12th and Buttonwood Streets, Philadelphia, Pa.

For the best Foot Power Jig Saw, address Goodnow & Wightman, 23 Cornhill, Boston, Mass.

Dry Steam, dries green lumber in 2 days; tobacco, in 3 hours; and is the best House Furnace. H. G. Bulkley, Patentee, Cleveland, Ohio.

Hexagon Iron—superior quality for screws, &c., 9-16 in. 09½, ⅝ in. 09, 11-16 in. 09, ¾ in. 08½, ⅞ in. 08, 1 in. 08, per lb. The above is price per bundle; single bars 2 cts. higher. Goodnow & Wightman, 23 Cornhill, Boston, Mass.

For hand fire engines, address Rumsey & Co., Seneca Falls, N.Y.

T. Shaw's Steam Gauges, Ridge av. & Wood st., Phila., Pa.

If you want a perfect motor, buy the Baxter Steam Engine.

Brown's Coalyard Quarry & Contractors' Apparatus for hoisting and conveying material by iron cable. W. D. Andrews & Bro., 414 Water st., N.Y.

Mining, Wrecking, Pumping, Drainage, or Irrigating Machinery, for sale or rent. See advertisement, Andrew's Patent, inside page.

For Tri-nitroglycerin, insulated wire, exploders, with pamphlet, as used in the Hoosac Tunnel, send to Geo. M. Mowbray, North Adams, Mass.

All kinds of Presses and Dies. Bliss & Williams, successors to Mays & Bliss, 113 to 122 Plymouth St., Brooklyn. Send for Catalogue.

For Steam Fire Engines, address R. J. Gould, Newark, N. J.

Presses, Dies, and Tinners' Tools. Conor & Mays, late Mays & Bliss, 4 to 8 Water st., opposite Fulton Ferry, Brooklyn, N. Y.

In the Wakefield Earth Closet are combined Health, Cleanliness and Comfort. Send to 36 Dey St., New York, for descriptive pamphlet.

Best and Cheapest—The Jones Scale Works, Binghamton N.Y.

If you want to know all about the Baxter Engine, address Wm. D. Russell, office of the Baxter Steam Engine Co., 18 Park Place, N.Y.

T. Shaw's Blast Gauges, Ridge av. & Wood st., Phila., Pa.

Seeds and Fertilizers. R. H. Allen & Co., New York.

Callow's New Patent Mode of Graining Wood,
Makes Painters grain all woods first class who never grained before; Likewise makes Grainers lightning fast who thumbed it out before. Address, with stamp, J. J. Callow, Cleveland, Ohio.

Wanted—A Purchasing Agent in every city and county, to supply Nye's fine Sperm Sewing Machine Oil. Put up in Bottles, Cans, and Barrels, by W. F. Nye, New Bedford, Mass.

Presses, Dies & all can tools. Ferracute Mch Wks, Bridgeton, N.J. Also 2-Spindle axial Drills, for Castors, Screw and Trunk Pulleys, &c.

The Patna Brand of Page's Patent Lacing is the best. Orders promptly filled by the Page Belting Co., No. 1 Federal St., Boston.

Absolutely the best protection against Fire—Babcock Extinguisher. F. W. Farwell, Secretary, 407 Broadway, New York.

Boiler and Pipe Covering manufactured by the Chalmers Spence Non-Conductor Co. In use in the principal mills and factories. Claims—Economy, Safety, and Durability. Offices and Manufactories, foot E. 9th street, New York, and 1202 N. 2d street, St. Louis, Mo.

Peck's Patent Drop Press. For circulars address the sole manufacturers, Milo, Peck & Co., New Haven, Ct.

"Anti Lamina" will clean and keep clean Steam Boilers. No injury to iron. Five years' use. J. J. Allen, Philadelphia, Pa.

Williamson's Road Steamer and Steam Plow, with Rubber Tires. Address D. D. Williamson, 32 Broadway, N. Y., or Box 1809.

For the best Recording Steam and Indicating Gauges, address The Recording Steam Gauge Co., 91 Liberty Street, New York.

For Solid Wrought-iron Beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

Belting as is Belting—Best Philadelphia Oak Tanned. C. W Arny, 301 and 303 Cherry Street, Philadelphia, Pa.

Boynton's Lightning Saws. The genuine $500 challenge. Will cut five times as fast as an ax. A 6 foot cross cut and buck saw, $6. E. M. Boynton, 80 Beekman Street, New York, Sole Proprietor.

Hydraulic Jacks and Presses, New or Second Hand, Bought and sold, send for circular to E. Lyon, 470 Grand Street, New York.

T. Shaw's Hydraulic Gauges, Ridge av. & Wood st., Phila, Pa.

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Notes & Queries.

[We present herewith a series of inquiries embracing a variety of topics of greater or less general interest. The questions are simple, it is true, but we prefer to elicit practical answers from our readers.]

1.—MORTARS.—What is the size of the largest mortars used in modern warfare?—W. B.

2.—VARNISH FOR RUBBER.—Can any one inform me how to make a flexible varnish for rubber, so as to give it a gloss?—W. W. W.

3.—POWER OF SCREW DRIVERS.—Can more power be obtained by the use of a long screw driver than of a short one, both having the same sized handles?—W. H.

4.—PROPORTIONS OF SAFETY VALVE GEAR.—Can any one give me a clear and concise method of computing the position of weight on the arm of a safety valve, all things being proportional?—M. I. C.

5.—ELECTRO-SILVERING GERMAN SILVER.—Can some one inform me if silver can be deposited on German silver by electricity, so as to stand annealing at a low red heat without blistering? I have tried it in many ways, but failed, as small blisters almost invariably show themselves.—J. H.

6.—PROTECTING COPPER FROM THE ACTION OF MERCURY.—Can any of your readers tell me of any solution that will prevent mercury from adhering to or eating copper? I have tried shellac and copal varnishes, but find them only temporary in their effect.—G. S. D.

Answers to Correspondents.

SPECIAL NOTE.—This column is designed for the general interest and instruction of our readers, not for gratuitous replies to questions of a purely business or personal nature. We will publish such inquiries, however, when paid for as advertisements at 1 00 a line, under the head of "Business and Personal."

ALL reference to back numbers must be by volume and page.

AQUARIUM CEMENT.—D. C. will find a recipe for a good one on page 267, Vol. XXV. of the SCIENTIFIC AMERICAN.

VELOCITY OF LIGHT.—G. M. V. points out an error in an article entitled "Celestial Space" on page 320 of the current volume. Light moves at 192,000 miles a second.

SUEZ CANAL.—To W. B.—The Suez canal is the property of a joint stock company, which the French Government helped to float by large concessions, "subventions," and guarantees.

F. W. G., of La.—You can make microscopic slides, showing the beautiful crystals of nitrate of silver, by placing a drop of the salt dissolved in water upon a slide and letting it dry. Then cover with glass in the usual manner Use benzole, not benzine, in preparing objects. For many things Canada balsam is the best substance to use.

SUPPLY OF WATER.—To H. G., of Vt.—Your question, as we understand it, is this: Can the quantity of water supplied by a pipe be increased by using a larger pipe without any additional head? It can, up to the delivery of all the water in the spring. The head of water makes a pressure of so much per square inch on the area of cross section of your pipe, and the supply will increase with the size of your pipe, so long as there is enough water at the head. The pipe to the tub will not affect your supply at the mill, unless both are open at once, in which case the water conveyed from the spring will be divided between the two.

THIRTY TUN MAGNETS.—I have a bet with a gentleman. I stated that there had been a magnet built that lifted thirty tuns; he disputed it, and I agreed to leave it to you. Am I right? If not, what was the strength of the largest magnet? Answer: There was a paragraph published in the SCIENTIFIC AMERICAN some time ago describing the then new magnet built by Wallace & Sons, of Ansonia, Conn., for the Stevens Institute, in which it was stated that the estimated lifting force of that magnet was between thirty and fifty tuns. But President Morton, writing to us recently, states that its actual lift is probably only from four to five tuns. This is the largest magnet that we remember. Its poles are each three feet three inches long and six inches in diameter. The next in size is one lately constructed by Lord Lindsay in London, and is four inches in diameter of poles. There was one of some similar size at the College of Pharmacy, London, and that used by Faraday and Tyndall was in oblong section about three inches by four inches, and two feet long. If the power of electromagnets increased with their size, these large magnets might lift thirty tuns, but as a fact, they do not by any means. The largest magnet made prior to that of the Stevens Institute lifted about 2½ tuns.

SUPERHEATING STEAM.—Query 1, page 354.—Let R. H. E. take a perfectly tight vessel, fill it completely with water, and he will be able to heat it (the water) to 400° Fah. without boiling, but the moment air is admitted, it instantly sinks to 212°. Now a little warning: If he heat it to 419°, the pressure would be 14,700 pounds per square inch, and at 500° it would equal 19,459 pounds to the square inch. The latter would support a column of mercury 3,243 feet in hight. (He will need a strong vessel.) The average latent heat of steam, as determined by the philosophers Watt, Southern, Lavoisier, Rumford, and Depretz, is 978° Fah., but Thompson says he does not think it can fall below 1,000°.—G. L. F.

PROPORTIONS OF ENGINE.—Query 8, page 354.—The small engine will do about 94½ per cent of the work that the larger engine is doing now.—P. R.

PROPORTIONS OF ENGINE.—Query 8, May 25.—An engine with a cylinder of 11 inch bore, 3 feet stroke, making 40 revolutions, will, with steam at 50 pounds pressure, be equal to 34½ horse power. An engine with 7 inch bore, 14 inches stroke, 150 revolutions per minute, with 80 pounds of steam, will be equal to 32½ horse power. Friction is not taken in account in either case. Deduct two horse power for friction, and you will have about the actual power of the engines.—A. H. G.

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Declined.

Communications upon the following subjects have been received and examined by the Editor, but their publication is respectfully declined:

AERIAL NAVIGATION.—C. M.
DIVINING ROD.—H. E. F.—I. N. B.
FORCE AND COUNTER FORCE.—J. S.
FRUIT JELLIES.—I. D. T.
PETROLEUM AND THE PRECIOUS METALS.—J. H.
PRODUCING MOTION.—A. U.
PROPULSION ON CANALS.—P. J. D.—C. A. W.
ROTARY MOTION OF THE PLANETS.—P. R.
SCIENTIFIC RELIGION.—C. B.
THE FIRST STEAM RAILROAD.—D. M.
THE FLIGHT OF BIRDS.—R. O. D.
THE RUBBER TIP PATENT.—R.
VELOCITY OF LIGHT.—C. E.
WATER METERS.—F. G. W.
ANSWERS TO CORRESPONDENTS.—A. G. B.—K. L.—N. W. H.—J. F. K.—J. G. M.
NOTES AND QUERIES.—J. A. S.—F. O. H.—P. C. L.—J. D. P.

Recent American and Foreign Patents.

Under this heading we shall publish weekly notes of some of the more prominent home and foreign patents.

CANAL LOCK.—Israel Townsend, Caperville, Va.—The object of this invention is to economize water in taking boats through canal locks. This object is accomplished by the employment of a side reservoir, into which about half of the water from the full lock is drawn off to lower the boat. The passage between the lock and reservoir is then closed, and the remainder of the water in the lock is let off at the lower gate as usual. When it is desirable again to fill the lock, another passage from the reservoir is first opened and the lock is partially filled therefrom, thus using that portion of the water, twice, and thereby saving a proportionate amount of water.

IRON FENCE PANELING.—Floyd G. Brown, Chapel Hill, Texas.—The invention consists in manufacturing a fence or fence paneling of hoop iron, so that it may be sold in sections, of any desired length, rolled up in a compact form, easily and cheaply transported to any distance, and put up by the farmer with rapidity and facility.

CHAIR SEAT FRAME.—Henry Buchter, Louisville, Ky.—The invention consists in improving the construction of a chair seat frame by using metallic corner pieces to connect the ends of rounds, whereby great strength and durability is given to that part of the chair which is subject to most strain.

BAG STRING INSERTER.—William J. Cussen, Richmond, Va.—The invention consists (1st) in a horizontal needle, having eye near the front and thread guide near the rear end; whereby a child can insert the gathering thread in a tobacco bag in one fourth the time in which it can be done with the hand by an adult. (2nd.) It consists in providing such a needle with a spring that not only guides but subsequently clamps the thread, so that it can be held taut while being cut off at the desired length. (3d.) It consists in providing a lever which shall simultaneously and by a simple movement place in position both clamp and cutter. (4th.) It consists in connecting the same lever that carries the thread cutter in front and finishes up the work, with a registering mechanism in the rear, by which the exact amount of work that has been done is always indicated.

FIRE ENGINE.—Jacob B. Van Dyne, Louisville, Ky.—The invention consists in arranging cylinders, provided with chemical ingredients which are mixed by the inversion of said cylinders, on pivots in the frame of a wheeled vehicle, and holding them in position by a latch. It also consists in providing the sides of frame with hooks upon which the ladder may be conveniently hung.

PROCESS FOR COATING IRON WITH ZINC.—John A. Grey and John Lippincott, Baltimore, Md.—This invention is an improvement on the common process of coating iron articles with zinc by dipping the articles in a bath of melted zinc resting on a stratum of melted lead within a pot of suitable size. By this process, no dross is deposited, and the wear of the article dipped will be practically nothing.

OYSTER CAN.—John A. Tillery, Baltimore, Md.—The invention relates to half square or narrow rectangular cans which are used in the trade for raw oysters, and it consists in forming a raised annular rib, about the channel in which the downward flange of the cap is soldered, for the purpose of preventing said channel from being, to a greater or less extent, filled by solder flowing from the joint between the top and body.

PEANUT THRESHER AND SEPARATOR.—John H. Walker, Walker's Landing, Tenn.—The invention consists in a machine whereby the peanuts and vines are thrust down an incline, caught by a revolving cylinder (whose teeth act in concert with those of a concave, to tear the vines to pieces and from the nuts), and transferred over an endless sieve to a reticulated cylinder, where the merchantable nuts are effectually separated from the vines and light nuts. By this machine, the nuts can be threshed, cleaned, and prepared for market, at a very small cost and with great economy in time.

WATER METER.—Edward Marsland, of Sing Sing, N. Y.—This invention relates to a new water meter, in which the water is conveyed in spiral jets against the recessed edge of a wheel, revolving the same in exact ratio to the volume brought against it, and balancing it at the same time to reduce friction. The invention consists, principally, in the arrangement of the wheel and the chamber whence the water emanates, and also in the application of projecting wings or fans to the wheel and case, for regulating its motion and making it conform to the head of water.

COUNTERSINK.—Lewis H. Hunt, of Saxton's River, Vt.—This invention consists in the construction of countersinks for wood. It consists in constructing the tool of a solid shank and pad, and a detachable cutter fastened by a screw.

CIRCULATION VALVE.—Robert Pallett, of New York city.—This invention enables the man at the end of the hose of a fire engine or of the discharge pipe of a pump to shut off the discharge at any time without endangering the mechanism of the engine or pump, and without its being necessary to stop the pump. The construction is of such a nature that the increased pressure in the discharge pipe, consequent on shutting off the discharge, forces a plunger into a chamber fixed on the pipe. The movement of the plunger raises a valve which covers the mouth of a passage leading back into the receiver of the pump, and by these means the water is returned and circulated without danger to the pump or hose pipe.

DRAFT ATTACHMENT TO PLOWS.—Sylvester H. Dailey, of Olcott, N. Y.—This invention relates to a new draft attachment to plows, and consists in the application to the draft rod of a guide wheel which is self locking and serves in place of a clevis. The guide wheel runs in a strap which is suspended by sleeves loosely from the draft pin. When draft is applied, these sleeves are pulled forward, and notches in one of them are made to engage with projections from the draft pin; this locks the wheel strap in a vertical position. When turning corners, etc., the strap is unlocked by the action of a spiral spring which encloses the draft pin.

FERTILIZER.—James P. Crutchfield, of Fayette Corner, Tenn.—This invention furnishes an improved manure distributer of very simple construction. It consists of the box or body of an ordinary wagon, so arranged as to allow the manure to fall easily through holes in its bottom. The holes are provided with slides to regulate the quantity of manure released, and under each is suspended a spout to convey it to the furrow. The spout is made adjustable as to its angle of inclination, so as to let the manure pour out at whatever rate may be required.

DISH WASHER.—Safford D. Moxley, of Keeseville, N. Y.—This invention consists of any suitable tub, pail, or bucket, with vertical pumps on the opposite sides. There are two pumps by preference, although one would suffice, which have large openings at their bottoms. The piston rods extend upward through the tops, and are connected by bent bars with a rocking lever which is pivoted to the sides of the tub and provided with handles for working the pistons; by which means the water is alternately taken into the pumps and forced out again with great intensity, calculated to wash the dishes, vegetables, or other articles in the tub very quickly.

TOY PISTOL.—Benjamin Haviland and George P. Gunn, Herkimer, N. Y.—This invention relates to the construction of toy pistols, and consists in a peculiar arrangement of the air cylinder and its piston in the stock, combined with a charging rod, to depress the piston and charge the pistol.

PHOTOGRAPHIC LENS.—Richard Morrison, Brooklyn, E. D., assignor to Scovill Manufacturing Company, New York city.—In this improved lens, which is designed for a wide angle view lens, the front combination is composed of a plano-convex lens of plate glass, cemented to another plano-concave lens of flint glass, of such curves as to produce a combined lens sufficiently over corrected for actinic rays to properly correct the back combination, which is chromatic, and is composed of two lenses of plate glass, the first, or interior one, being a plano-convex, or double convex of the same focus as the second or exterior, which is a meniscus of nearly the same radiuses as the front combination.

CULTIVATOR.—Asa Bennett Springsteen, Schodack Landing, N. Y.—This invention furnishes a simple, convenient, and effective plow for cultivating corn and other crops planted in rows; it may be readily adjusted to scrape the soil toward or from the plants, as may be desired. It consists in attaching, adjustably, a surface scraper to the plow standard, which scraper is made triangular with its rear edge curved downward, so as to scrape the soil to one side. The scraper is followed by a leveler, also secured to the standard, which is provided with a downwardly projecting tooth. This stirs up the soil near the plants, and roots up any weeds, etc., that may be growing near them, and, also, smooths the surface.

THREE HORSE EQUALIZER.—Adam Lafayette Thomas, George James Thomas, and Thomas Newton Thomas, Lee's Summit, Mo.—This invention furnishes an improved three horse equalizer, and is so constructed that it may be readily adjusted so that the three horses may all have an equal amount to pull, or so that either the single horse or team may have the advantage, as may be desired; it consists in the arrangement of adjustable bars, which are pivoted to the tongue, and connected by chains so as to adapt them to receive the whiffletrees.

HAY ELEVATOR AND CARRIER.—John H. White, Columbus City, Iowa.—This invention relates to a new arrangement of carriage for elevating and conveying hay, straw, and other material for stacking or other purposes. The carriage runs, suspended by pulleys, on a rope stretched between two posts, and by means of various ingenious contrivances is made to take up its load in one spot, and to deposit it in another.

EARTH AUGER.—Xenophon Earle, Depere, Wis.—The boring part of this improved post hole auger consists of two scoops, which are shaped like half cones; they are connected by a scissors joint in such a manner that they may be securely shut together—thus completing the cone. When shut, one edge of each scoop projects beyond the opposing edge of the other, forming a cutter to dig into the earth, and leaving a space through which the dirt passes into the interior of the cone. The dirt is discharged by opening the cone. By this construction, the auger is readily and quickly forced into the ground, and when filled is drawn out easily, the dirt dug out by the auger being carried inward and packed into the cavity or space between the scoops, instead of being packed around the outer part of the bore or hole.

FEED WATER HEATER FOR STEAM BOILERS.—Joseph Rodgers, Clarington, Ohio.—This invention has for its object to economize fuel in the heating of water in steam boilers, and to insure a more thorough result from the heat.

TILTING MACHINE.—Bowen Mathews, Keyport, N. J.—The object of this invention is to furnish a machine for the amusement or exercise of children, invalids, and others, designed as a substitute for the rotating swing, etc., now in vogue. A couple of pulleys or rollers are attached to a ceiling or horizontal beam at some distance apart, and over them is passed a band, from each end of which is suspended a chair. The length of the band is adjustable. The chairs are made to rise and fall alternately by their occupants.

STALK CHOPPER.—This invention has for its object to furnish a simple, convenient, and effective machine for cutting or breaking up corn stalks and cotton stalks so that they may be conveniently turned under by the plow. It consists of a roller, made of any material possessing the requisite weight, which carries knives or cutting plates attached to its periphery, and is suspended, free to revolve, in the draft frame. By this construction, as the machine is drawn forward, the roller breaks down the dry stalks, and the knives cut or break them into pieces, longer or shorter, according to the distance apart of the knives, so that they will not interfere with the plowing.

SWITCH FOR PRINTING TELEGRAPHS.—Patrick Kenny, of New York city.—The object of this invention is to enable the operator, when working with several telegraphic printing instruments, to use them, one after another, without changing the different keys or using a separate battery for each. It consists in the employment of an electromagnetic switch instrument which is connected with the magnet and printing lever of each printing instrument in a manner to insure the following operation: As long as its printing lever is at rest, that printing instrument which is connected by metallic contact with the switch wheel of the switch has a current established through its magnet and can be worked in the usual way. Only one instrument at one time can be electrically connected with the switch wheel, as the springs belonging to the others are then resting on insulated portions of the wheel. Whenever the printing lever is raised, the circuit through the printing magnet is interrupted and metallic connection with the magnet of the switch is made. This enables the operator to establish, by touching an appropriate key, a current through the switch magnet which causes the switch wheel to rotate and brings the spring belonging to another printing instrument into metallic contact with it, while it breaks contact with the first. The key of the switch magnet is touched as often as is necessary to bring the right instrument into circuit, supposing more than two are connected with it. If, during the elevation of the printing lever, the key is not touched, the printing instrument connected with it will be in circuit on its descent.

TUG BUCKLE.—James C. Barrows, of Centerville, Iowa.—This invention furnishes an improved tug buckle, which does not wedge the tug so as to injure it; and which is easily adjusted and effective in operation. It consists of an ingenious arrangement of various parts which could not be explained without drawings.

MACHINE FOR FINISHING DRAIN TILES.—Andrew L. Brown, of London, Ohio.—This invention furnishes an improved machine for beveling one end and recessing the other end of lengths of drain tiles so as to form a joint. Its principal features are: An automatic carrier which receives the tile, holds it while its ends are operated on, and disharges it when finished; and the leveling apparatus, which consists of two wire cutters, set parallel with each other, and carried on two movable shafts between which the tile is placed to have its ends cut.

SEED PLANTER.—Augustus Richards, of Anderson, Texas.—This invention furnishes a simple, convenient, and reliable machine for planting corn, cotton seed, and other seeds, which is so constructed that it may be conveniently adjusted to plant less or more seed, as may be desired. The seed dropper is barrel shaped and is carried between the wheels of the machine. It has a band around its center which is pierced with discharge holes through which the seeds fall to the ground. These discharge holes are shut or opened by slides which are adjusted so as to regulate to a nicety the quantity of seed dropped. There are a furrowing plow and other attachments, which we have not space to describe.

ELEVATOR.—Alfred B. Darling and James Bones, of New York city.—The object of this improvement is to prevent the falling of the elevator platform in case of the breakage of the main lifting rope. This is accomplished by an ingenious arrangement of various devices.

SEWING MACHINE CASE.—Gustav Heckel, of Belleville, Ill.—This invention furnishes an improved sewing machine case and table. The case consists of a back piece, which is hinged within a slot along the rear side of the table, and a front piece, connected by a flexible top. The two sides are hinged to the back piece. When closed, the sides form a support for the flexible top. A prominent feature of the invention is an adjustable piece which fills in the slot behind the hinged back so as to preserve the symmetry of the table when the case is closed.

WATER METER.—Hezekiah Olney, of New York city, assignor to himself and Lucius R. Townsend, of Malone, N. Y.—This invention consists in making the meter in two compartments, one for receiving, the other for discharging the liquid, so that from the latter vessel the water may flow continuously. The water flows through a pipe into the receiving compartment and, on filling the same to a certain hight, raises a float which operates a valve attached to the pipe. The movement of the valve shuts off the flow of water into the receiving compartment and, at the same time, opens a channel between that and the discharging compartment. When the water has passed from one compartment to the other, the float falls and the operation is repeated. Other devices are connected with the apparatus, which space prevents us describing in detail.

FENCE.—Andrew A. Garver, of Albion, Iowa.—This invention consists mainly in arranging the cross slats of the panel diagonal to the rails of the same to admit of a better connection of the panel with the double brace than in other portable fences. The fence consists of panels composed of rails connected together by upright slats placed in an inclined position, so that the upper rail will project six inches, more or less. The lower ends of the slats project down below the lower rail. In the lower edge of the lower rail are notches, just inside of the uprights. These notches and the arrangement of the slats allow the upper and the lower rails of the panel to engage with the brace of the fence.

DAMPER FOR FIRE PLACE.—Joseph Bridgham, of New York city.—This invention relates to a new damper for fire places, to be used in chimneys above grates for regulating the draft. It consists in providing the damper with projecting pivot pins and stops at the ends, and in the use of metallic sockets for its support built into the wall.

PACKING.—George Tetley and Charles D. B. Fisk, of Providence, R. I.—This invention relates to an improvement in metallic packing for piston and valve rods, and for all similar purposes. The packing is made in sections; each section consisting of two parts, which are made to fit each other and the rod they enclose. The sections are laid one above the other, reversing the position of the two parts in each alternate section, and are kept pressed against the rod by two springs placed between them and the ox. The boxes may be circular, rectangular, or of other form.

BALLASTING VESSELS IN PORT.—Francesco Demartini and John Chertizza, of Brooklyn, N. Y.—Under the present practice, when a vessel arrives in port and discharges her cargo, ballast must be immediately taken in to prevent careening and consequent injury to herself or other crafts. To avoid the loss of time and expense attending this course, this invention employs ballast logs, connected with the vessel by ropes or chains, that lie alongside and float in the water. The logs are not intended to hold the vessel down in the water, but merely to act as counter or balance weights when she attempts to keel over from any cause.

STOVE PIPE FITTER.—William Volk, of Buffalo, N. Y.—The object of this invention is to provide a simple, durable, and effective device for fitting stove pipes together, as, for instance, where the two parts are of the same size, or where bruised or out of shape. It consists of a frame which has two jaws, with lugs for two levers. One jaw is corrugated or serrated, and the other is smooth. Each jaw is provided with a lever of corresponding form, confined by fulcrum pins to the lugs. By the application of the serrated jaw and lever to the pipe, the latter is made to partake of the form of the jaw, and its end is consequently reduced in diameter. When the other jaw and lever are applied, the tendency is to expand and smooth out the pipe. When the two parts of the pipe are operated upon in this manner—that is, one corrugated or serrated, and the other expanded—they will fit together and may be joined without difficulty.

SAND AND GRAVEL SEPARATING MACHINE.—Nicholas J. Keller, of East Birmingham, Pa.—This invention relates to a new machine for separating sand and gravel or other materials from the matter elevated by dredging machines. The framework of the machine is coupled by a dredge boat or dredging apparatus, from which an endless chain or apron extends over one end of the separator. This apron or chain conveys in its buckets all the matter raised by the dredge on to an inclined sieve or perforated spout, which is securely fixed at one end of the frame. Water is conveyed to the spout by another endless chain or apron, and serves to so loosen the mud that all gravel and sand passes through, but all other matter is discharged. What passes through the sieve is carried toward the inner part of the separator into the higher end of an inclined perforated cylinder. This cylinder, being covered with wire screen and revolved by suitable mechanism, separates the sand and gravel by letting the sand pass through its finer meshes into a box, and the gravel through the larger meshes at the lower part into another receptacle. All extraneous matter or refuse is discharged overboard through the lower end of the cylinder, which is open.

Inventions Patented in England by Americans.

[Compiled from the Commissioners of Patents' Journal.]

From May 14 to May 20, 1872, inclusive.

CAR COUPLING.—C. L. Horack, Winona, Minn.
ELECTRIC SIGNALS.—E. A. Calahaw, of Brooklyn, N. Y., London, Eng.
FOUL AIR TRAP.—J. Daniels, Washington, D. C.
HUB.—W. Lyman, East Hampton, Mass.
MAGIC LANTERN.—L. J. Marcy, Philadelphia, Pa.
MAKING PINS.—T. B. De Forest, of Birmingham, Conn., London, Eng.
PAPERING PINS.—T. B. De Forest, of Birmingham, Conn., London, Eng.
PAVING BLOCKS, ETC.—F. A. Luckenbach, New York city.
PIANOFORTE.—C. F. T. Steinway, New York city.
PROJECTILES, ETC.—J. G. Butler, Fortress Monroe, Va.
PROPELLING SHIPS.—L. B. Bruen, New York city.
SEAT AND DESK.—H. W. Curtis, New York city.
SEEDING FRUIT.—G. L. Taylor, D. Holland, Springfield, Mass.
SHEET IRON.—W. Rogers, Apollo, T. J. Burchfield, Allegheny, Pa.
SHOEMAKING MACHINERY.—W. J. B. Mills, Philadelphia, Pa., D. W. C. Taylor, Elizabeth, N. J.
SLIDE VALVE.—G. Westinghouse, Jr., of Pittsburgh, Pa., London, Eng.
STEEL.—T. Brooks, Minerva, Ohio.
TIMEKEEPER.—H. B. James, Trenton, N. J.
VEHICLE FOR PAINTING.—E. Densmore, New York city.
WOOD CUTTING MACHINERY.—J. Richards, Philadelphia, Pa.

FOREIGN PATENTS---A HINT TO PATENTEES.

It is generally much better to apply for foreign patents simultaneously with the application in the United States. If this cannot be conveniently done, as little time as possible should be lost after the patent is issued, as the laws in some foreign countries allow patents to any who first make the application, and in this way many inventors are deprived of valid patents for their own inventions. It should also be borne in mind that a patent is issued in England to the first *introducer*, without regard to the rights of the *real* inventor; therefore, it is important that all applications should be entrusted to responsible agents in this country, who can assure parties that their valuable inventions will not be misappropriated. The population of Great Britain is 31,000,000; of France, 37,000,000; Belgium, 5,000,000; Austria 36,000,000; Prussia, 40,000,000; and Russia, 70,000,000. Patents may be secured by American citizens in all of these countries. Mechanical improvements of all kinds are always in demand in Europe. There will never be a better time than the present to take patents abroad. We have reliable business connections with the principal capitals of Europe. A large share of all the patents secured in foreign countries by Americans are obtained through our Agency. Address

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Index of Inventions

For which Letters Patent of the United States were granted

FOR THE WEEK ENDING MAY 28, 1872, AND EACH BEARING THAT DATE.

Acid and paint from the material used to purify gas, manufacture of, J. Hughes ... 127,350
Alarm apparatus for safes, etc., burglar, S. J. Hoffman ... 127,165
Annunciator, S. F. Nichols ... 127,185
Arm rest, compositor's, C. L. Alexander ... 127,208
Atomizer, H. D. Lockwood ... 127,356
Bag holder and truck, combined, J. Hewitt ... 127,346
Bag, handle, fastening for traveling, M. Schwerin ... 127,273
Banjo, E. B. Mansfield ... 127,179
Barrel roller, S. G. Hill ... 127,236
Bed bottom, W. Cooke ... 127,152
Bed bottom, H. T. Smith ... 127,278
Bed, parlor, H. Goodrich ... 127,338
Bedstead, H. B. Coyle ... 127,312
Bedstead fastening, L. May ... 127,255
Bedstead fastening, J. W. Elstun ... 127,228
Bee hive, J. B. Staunton ... 127,281
Beer from barrels, apparatus for forcing, J. Devlin ... 127,156
Bell, gong, H. A. Foss ... 127,333
Blind slat adjuster, W. B. Sloan ... 127,376
Blow pipe, J. Cook ... 127,151
Blower, Moore and Pruett ... 127,358
Boat, propelling canal, C. H. Jenner ... 127,401
Bobbin winder, J. L. Demarest ... 125,155
Boiler tube scraper, J. Hobday, Jr. ... 127,237
Boiler feeder, steam, S. J. Parker ... 127,362
Boiler, safety valve for, R. P. Staats ... 127,198
Boiler, steam, O. Wehoskey ... 127,394
Boots and shoes, polishing heels of, C. H. Helms ... 127,234
Boring tool, F. S. Allen ... 127,209
Boring machine, hub, A. Bascom ... 127,296
Boring machine, swivel for rock and well, J. H. Luther ... 127,177
Bottle holder, W. O. Pond ... 127,268
Box opener, J. W. Hankenson ... 127,342
Brake and car starter, pneumatic, C. A. Haskins ... 127,164
Bread slicing machine, Iske and Steinheiser ... 127,242
Bridge, swing, G. R. Winkler (reissue) ... 4,926
Brushing clothes, machine for, W. M. Blume ... 127,301
Buildings, mode of constructing, C. M. Amsden ... 127,289
Burner, gas, F. A. Fisher ... 127,329
Burning fluid, testing, P. Millspaugh ... 127,259
Bustle, T. F. Fessenden ... 127,327
Butter worker, J. Romans ... 127,271
Button, R. J. Monks ... 127,183
Can, oyster, J. A. Tillery ... 127,388
Canal lock, I. Townsend ... 127,389
Car body, R. L. Omensetter ... 127,186
Car brake, S. E. Harrison ... 127,233
Car coupling, W. W. Pitman ... 127,188
Car spring, H. N. Eggleston ... 127,160
Car, air brake for railway, C. Fogelberg ... 127,332
Car axle box, C. A. Haskins ... 127,163
Carbureter, C. H. Pierson ... 127,366
Carding machine, L. St. George ... 127,199
Carpet stretcher, E. W. Bullard ... 127,303
Carriage, saddle clip for, F. Seward ... 127,275
Carriage axle, A. B. Crandall ... 127,222
Carriage axle, machine for turning, J. G. Aram ... 127,211
Cartridge, metallic, J. W. Cochran ... 127,308
Cart, hose, Shaw and Ashley ... 127,277
Chair, folding, J. C. Compton ... 127,221
Check box for railroad conductors, registering, J. S. Stridiron ... 127,200
Cigars, forming binder, filler, and wrapper for, R. W. Heywood ... 127,235
Cigar, T. W. Kreitz ... 127,172
Clothe's dryer, G. L. Woods ... 127,206
Cock, basin, W. Gordon ... 127,340
Collar, Godfrey and Fuller, (reissue) ... 4,916
Compound for destroying insects, J. G. Barker ... 121,141
Compound for destroying nicotine in tobacco, chemical, S. O. Bentley ... 127,215
Cooking apparatus, steam, J. A. Little ... 127,253
Core barrel, collapsing, R. Lye ... 127,178
Cornice, extension window, A. Pohl ... 127,367
Counter, portable store, J. H. Davis ... 127,223
Cultivator, R. H. Avery ... 127,293
Curtain fixture, F. B. Scott ... 127,274
Dental drill, W. M. Reynolds ... 127,269
Die cutter stock, H. C. Meyer ... 127,257
Digger, potato, A. Heuling ... 127,345
Drawer for sewing machine table, swinging, W. H. Alrich ... 127,136
Dredging machine, N. A. Williams ... 127,397
Dryer, grain, F. H. C. Mey ... 127,256
Egg carrier, S. H. Smith ... 127,379
Electromagnetic motor, W. H. Richardson ... 127,369
Elevator, L. Atwood ... 127,138
Elevator, hydraulic, C. W. Baldwin ... 127,139
Engine, air, W. Alworth ... 127,137
Engine, traction, W. C. Bibb ... 127,143
Engine, reciprocating, G. H. and C. P. Deane ... 127,154
Engine, steam pumping, G. H. and C. P. Deane ... 127,153
Engine, pumping, E. D. and F. W. Eames ... 127,322
Engine, safety stop for steam, W. H. Darling ... 127,315
Engine, ammoniacal gas, W. H. Laubach ... 127,250
Engine, fire extinguishing, J. B. VanDyne ... 127,390
Faucet, basin, W. Gordon ... 127,341
Fence, C. H. Strowger ... 127,282
Fire arms, magazine for, W. H. Elliott ... 127,323
Fire arms, breech loading, J. F. Thomas ... 127,386
Fire kindler, B. Pickering ... 127,366
Flask, molder's, S. Williamson ... 127,398
Fountain, aerated water, J. C. Johnson ... 127,248
Fruit and vegetable crusher, R. Daniels, (reissue) ... 4,915
Furnace, hopper for blast, D. Bauman ... 127,214
Furnace, hot air, C. M. Drennan ... 127,321
Furnace, sawdust feeder for, M. Garland ... 127,335
Furnace for burning saw mill and other refuse, P. Walker ... 127,393
Furnace, hot air, J. R. Barker ... 127,140
Gas retort, L. Blair ... 127,144
Gas apparatus for melting snow on sidewalks, Folkmann and Kolgen ... 127,162
Gas machine, J. Kaufmann ... 127,245
Gas retort, T. G. Springer ... 127,381
Glass, machine for grinding and polishing, A. Hathaway ... 127,344
Governor, J. S. Camac ... 127,305
Grate, furnace, C. Van Wagenen ... 127,203
Grinder, coffee, C. Krutz ... 127,249
Guard for nursery door and window, A. Howard ... 127,166
Hair, etc., machine for picking curled, Lannay and Webb ... 127,354
Harvester, J. H. Elward ... 127,324
Harvester, C. Lidren ... 127,252
Harvester, pitman connection for, H. Howe ... 127,240
Harvester rake, L. Miller ... 127,181
Heater car, H. R. Robbins, (reissue) ... 4,922
Heating by hot water, apparatus for, G. Nixon ... 127,262
Hinge for safe door, sliding, W. H. Butler ... 127,147
Hoes, manufacture of, Acheson and Ridley ... 127,288
Hook, snap, A. A. Hotchkiss ... 127,347
Ice, manufacture of, Martin and Beath ... 127,180
Jack, builder's, J. F. Darley ... 127,314
Jewelry box, fastening for, H. Hoefer ... 127,238
Journal bearing, S. Croll, (reissue) ... 4,914
Knife sharpener, T. K. Knapp ... 127,170
Knife for uncapping the cells of honeycombs, H. O. Peabody ... 127,187
Lamp chimney cleaner, H. Fellows ... 127,230
Lasting knees, C. H. Haskell ... 127,343
Lathe, metal turning, W. Sellers ... 127,195
Lathe for turning irregular forms, E. K. Wisell ... 127,286
Lead, manufacture of, C. L. Wheeler ... 127,395
Leather, treating tanned, B. H. Lightfoot, (reissue) ... 4,920
Letter sheet blanks, A. C. Fletcher ... 127,330
Locomotive wheel, applying chalk to, N. Sehner, (reissue) ... 4,924
Loom for weaving slat blinds, J. L. Devol ... 127,318
Lubricating axle nut, D. Dalzell ... 127,313
Lubricator, F. Ficht ... 127,161
Lubricator, car axle, Vose and Evans ... 127,391
Mallet, A. Partridge ... 127,363
Mask, safety, D. W. Flora ... 127,331
Medical compound or liniment, W. H. Wagoner ... 127,283
Mill, fulling, S. M. Pike ... 127,267
Molder's gate or sprue, J. M. Killin ... 127,351
Motion, device for changing, D. Shively ... 127,196
Motion and preventing reaction, transmitting rotary, C. Sellers ... 127,192
Movement, mechanical, H. H. Baker ... 127,294
Movement, mechanical, A. C. Burner ... 127,219
Mowing machine, J. Clarridge ... 127,220
Nipple for nursing bottle, H. D. Lockwood ... 127,357
Nuts, device for locking, P. L. Gibbs ... 127,336
Nut, lock, J. Dinsmore ... 127,320
Nut, lock, A. Morley ... 127,359
Oil, lubricating, H. and C. Fink ... 127,328
Oil cup, automatic, J. H. Wilkinson ... 127,205
Ordnance, breech loading, N. Thompson ... 127,202
Ore crusher, G. Mitchell ... 127,260
Ozone, apparatus for generating, O. Loew ... 127,175
Packing, piston rod, J. W. Lynch ... 127,254
Pail and night stool, combined chamber, S. Smith ... 127,378
Paper cutting machine, T. B. Dooley ... 127,226
Pavement, concrete, C. Scriber ... 127,190
Pavement, wood, J. J. Burrows ... 127,304
Peach stoner, J. S. Lester ... 127,355
Photographing embossing apparatus, H. Holt ... 127,348
Pianoforte, C. F. T. Steinway ... 127,383, 127,384
Planing the facets of polygonal bars, etc., machine for, W. F. Batho ... 127,142
Planter, cotton seed, W. R. Wright ... 127,400
Planter, cotton, J. Wood ... 127,399
Plow, grading, A. P. Hopkins ... 127,239
Plow, A. Sanborn ... 127,372
Plow, G. W. Thompson, (reissue) ... 4,925
Pocket, safety, L. Goodyear ... 127,339
Power, motive, W. S. Reeder ... 127,368
Power, motive, B. J. Sage ... 127,189
Press, steam cotton, A. Baldwin, (reissue) ... 4,913
Press, copper lined cylinder for hydraulic, C. Sellers ... 127,191
Press, gin, and horse power, combined cotton, J. M. Shaw, Sr ... 127,276
Printing press, F. O. Degener ... 127,316
Protractor and parallel ruler, W. L. Althorp ... 127,210
Pruning knife, J. Fasig ... 127,229
Pruning shears, G. D. Spielman ... 127,279
Pulp, machine for preparing wood for, A. K. Gilmore ... 127,337
Pump, R. M. Lafferty ... 127,173
Pump for liquid freight, S. F. Paullin ... 127,364
Pump, C. Wilson ... 127,284
Rack, clothes, G. W. and E. J. Godfrey ... 127,232
Railway track, apparatus for cleaning, J. Paradis ... 127,361
Railway rail, joint for, J. W. Stell ... 127,385
Rake, horse hay, N. M. Barnes ... 127,295
Rake and tedder, combined, R. H. Russell ... 127,370
Refrigerator, drip pan for, D. Mulcahy ... 127,184
Retort lid, fastening for, G. Stancliff ... 127,280
Rods, machine for upsetting, G. G. Burgess ... 127,146
Sash balance, Arnold and Hanschildt ... 127,292
Sash balance, W. H. King ... 127,247
Sash holder, W. H. King ... 127,248
Saw tooth swage, W. P. Miller ... 127,182
Saw frame, S. P. Tift ... 127,387
Sawing machine, scroll, W. H. Doane ... 127,225
Sawing machine, T. B. Fagan ... 127,326
Sawing machine, scroll, S. Ide ... 127,241
Sawing machine, C. L. Schulz ... 127,373, 127,374
Scissors, pocket, A. J. Young ... 127,207
Seed cleaner, cotton, W. H. Delamare ... 127,224
Seine float, fishing, Brown and Jarvis, Jr ... 127,218
Separator, grain, D. Y. Milligan ... 127,258
Sewing machine, E. Bouscay, Jr ... 127,145
Sewing machine cover, D. C. Junett ... 127,244
Sewing machine, tuck marker for, J. S. Hugg ... 127,349
Sewing machine, marker for, E. S. Zentzer ... 127,287
Sewing machine, ruffler for, C. Scharffe, (reissue) ... 4,923
Sewing machine, attachment for, G. E. Dolton ... 127,157
Sewing machine, hemming and binding attachment for, G. E. Dolton ... 127,158
Shutter, operating window, H. Besse ... 127,216
Siphon, J. W. Fox ... 127,334
Splints, tool for cutting, J. L. Devol ... 127,319
Sofa, bed, F. Krater ... 127,171
Spinning machine, spindle for, G. Draper ... 127,159
Spinning and twisting roving, speeder for, T. Mayor, (reissue) ... 4,921
Spring, door, J. J. Cowell ... 127,311
Steam trap, automatic, J. K. Stayman ... 127,382
Stereoscope, W. B. Glover ... 127,231
Still, etc., vacuum, C. G. C. Simpson ... 127,197
Stalk holder, G. H. Aylworth ... 127,212
Stone, artificial, H. A. Cooke ... 127,309
Stone, manufacture of artificial, J. E. Park ... 127,264
Stove, zinc board for, W. S. Cotrell ... 127,310
Stove heating, G. Candee ... 127,306
Stove pipe shelf, J. H. Betts ... 127,217
Stove pipe drum, B. J. Hobson, (reissue) ... 4,918
Stove, fire place or Franklin, J. Peckover ... 127,265
Supporter, abdominal, A. T. Kirk ... 127,352
Table, extension, J. J. Arnaud ... 127,291
Table slide, W. J. Boda ... 127,302
Table, revolving, Beem and Morgan ... 127,299
Table and drawing board combined, C. W. Clift ... 127,149
Table, extension, F. Huber ... 127,168
Tin from tin scrap, process and apparatus for removing, C. A. Seely ... 127,375
Thill coupling, W. Bailey ... 127,213
Thill coupling, C. C. Caner ... 127,148
Thill coupling, Devereaux and Davis ... 127,317
Thrasher and separator, peanut, J. H. Walker ... 127,392
Tongs, pipe, H. Herbert (reissue) ... 4,917
Toothpicks, machine for making, Noble and Cooley ... 127,360
Toy revolver and fire cracker holder, A. M. Smith ... 127,377
Transplanter, H. C. Cook ... 127,150
Trap, fly, V. D. Beach ... 127,297
Trivet, J. Peckover ... 127,266
Tube, machine for making wire, W. C. Edge ... 127,227
Vehicle, wheel for, A. L. Blackman ... 127,300
Vehicle, torsion spring for, J. Kieser ... 127,169
Vehicle, axle for, A. Y. Hubbell ... 127,167
Vehicle, spring for, C. W. Saladee ... 127,272
Vehicle, pleasure, C. W. Saladee ... 127,371
Wagon brake, D. T. Snelbaker ... 127,380
Wash board, Epeneter and Grahl ... 127,325
Washing machine, L. B. Anderson ... 127,290
Washing machine, W. B. H. Beach ... 127,298
Washing machine, J. P. Packer ... 127,263
Washing machine, Walker and Adams ... 127,204
Water closet, W. S. Carr ... 127,307
Well tools, grab for extracting, J. H. Luther ... 127,176
Wheel, machine for bending fifth, C. Kieser (reissue) ... 4,919
Wheel, wind, N. P. Mix ... 127,261
Whip, A. B. Kiersted ... 127,246
Whirligig, W. H. Lansing ... 127,174
Wire stretcher, C. H. Strowger ... 127,201
Wood articles, manufacture of pressed, O. Knipfer ... 127,353
Wood divider, electrical, G. Robinson ... 127,270
Wood bending machine, Whipple and Trowbridge ... 127,396

EXTENSIONS GRANTED.

20,249.—HULLING AND THRASHING MACHINE.—John C. Birdsell.
20,267.—THICK WOVEN FABRICS.—J. Gujer.
20,313.—DEVICE FOR SQUARING AND MARKING.—H. Smith.
20,306.—AFFIXING POST OFFICE STAMPS.—G. K. Snow.
20,277.—GRINDING AND SIZING PAPER PULP.—J. Jordan, Jr., T. Eustice.

DISCLAIMERS.

39,779.—E. C. Wooster, New York city.
65,184.—W. C. Durant, W. Buswell, West Troy, A. Brown, Troy, N. Y.

DESIGNS PATENTED.

5,876.—TABLE SPOON.—B. D. Beiderhase, New York city.
5,877.—PICTURE FRAME.—J. J. Gray, Boston, Mass.
5,878 to 5,880.—CARPETS.—A. Heald, Philadelphia, Pa.
5,881.—FLOOR CLOTH.—A. Heald, Philadelphia, Pa.
5,882.—STOVE FRONT.—G. Smith, H. Brown, Philadelphia, Pa.

TRADE MARKS REGISTERED.

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834 and 835.—WOVEN GOODS.—M. Landenberger & Co., Philadelphia, Pa.
836.—BANK CHECK DETECTOR.—J. W. McKennan, Philadelphia, Pa.
837.—VACCINE.—J. Milhau's Sons, New York city.
838.—INJECTING SYRINGE.—W. Molesworth, New York city.
839.—COTTON SHEETING, ETC.—Paton & Co., New York city.
840.—AXES.—The Underhill Edge Tool Company, Nashua, N. H.
841.—BITTERS.—J. T. Webber & Co, Springfield, Mass.
842.—TEAS, ETC.—J. G. Worth, New York city.

FOR THE WEEK ENDING JUNE 4, 1872.

Alarm, burglar, G. W. Love ... 127,421
Ammonia, sulphur, etc., from gas lime, preparation of, R. J. Everett ... 127,470
Animal matter, oil, etc., drying and deodorizing, M. J. Stein ... 127,670
Anthracine, manufacture of coloring matter from, W. H. Perkins ... 127,426
Axles, coupling for divided, C. A. Nutting ... 127,637
Bag string inserter, W. J. Cussen ... 127,579
Band instrument, military, R. H. Gates ... 127,591
Barrels, machine for crozing and chamfering, J. Greenwood ... 127,478
Bedstead, wardrobe, R. M. Austin ... 127,546
Bee hive, S. V. Greer ... 127,479
Bee hive, S. D. McLean ... 128,489
Bee hive, C. H. Potter ... 127,513
Beer cooler, J. M. Otto ... 127,639
Bell, door, Delavan and Dyson, (reissue) ... 4,932
Blocks, building, J. L. Boone ... 127,554
Blocks, mold for concrete, J. P. Campbell ... 127,562
Boat, canal, N. H. Murray ... 127,424
Boat, propulsion of canal, T. Smith ... 127,437
Boiler, water circulating pipe for steam, W. Dillon ... 127,466
Boiler, wash, S. L. Cheney ... 127,567
Boot and shoe heels, machine for burnishing, G. C. Hawkins ... 127,414
Boots, machine for cutting out, B. Millett ... 127,630
Boots and shoes, manufacture of, E. Alexander, (reissue) ... 4,933
Box for candy, etc., G. Ruger ... 127,431
Box, railroad conductor's check, E. Keith ... 127,487
Box, cigar, P. Greenwald ... 127,597
Breweries, apparatus for cooling, L. Schulze ... 127,647
Brick, manufacture of, T. C. Kier ... 127,419
Brick, process of coloring, W. Boies ... 127,551
Brick or tile, steam boiler, W. Dillon ... 127,467
Bridge for ferry boat, W. J. Alsop ... 127,542
Bridge, truss, M. S. and H. B. Cartter ... 127,564
Buggy, gear, elastic, I. N. Topliff ... 127,441
Buildings, construction of, W. McGiniss ... 127,497
Burner, clutch for supporting water bowl under gas, S. Gardner ... 127,590
Burning hydrocarbon vapors, apparatus for, F. C. Ambler ... 127,402
Butter worker, G. Ruston ... 127,520
Cages, manufacture of bird, G. Gunther ... 127,598
Can, cotton, R. R. Hulme ... 127,486
Can, etc., steam joint for, E. A. Thomas, (reissue) ... 4,936
Candy, etc., machine for slicing, J. P. Anderson, (reissue) ... 4,927
Car wheel, construction of, W. M. Arnold ... 127,544
Car coupling, H. W. Barnum ... 127,450
Car coupling, E. W. Harvey ... 127,601
Car coupling, G. W. Putnam ... 127,644
Car, street, J. Stephenson ... 127,526
Car brake, street, J. Stephenson ... 127,525
Car, axle box for street, J. Stephenson ... 127,524
Car axle box, elastic check for, J. Stephenson ... 127,523
Car wheel and axle, J. S. Upton ... 127,661
Car, cattle, A. Welch ... 127,443
Car starter, W. M. Watson ... 127,531
Carbureter, F. A. Fisher ... 127,409
Carding machine, Chase and Platt ... 127,566
Carpet stretcher, D. Pray ... 127,515
Carriage, children's, G. L. Atwater ... 127,404
Car wheel, spoke socket for, S. Mitchell ... 127,501
Cart, dumping, S. Doubleday ... 127,407
Caster for sewing machine, D. J. Clark ... 127,571
Chair seat frame, Henry Buchter ... 127,560
Chair, sewing machine, S. W. Cozzens ... 127,578
Cheese bandagers, Hamer, Bolston, and Robinson ... 127,600
Churn, Davidson and Durrett ... 127,406
Cigar holder and perforator, R. J. Sheehy ... 127,649
Clock for steam boiler, detective, H. Pieper ... 127,641
Clock, electric, V. Himmer ... 127,483
Clothes wringer, W. Cooper ... 126,577
Clothes dryer, Harding and Willis ... 127,481
Clothes wringer, H. E. Smith ... 127,521
Cock, gage, W. H. Downing ... 127,468
Cock, stop, G. C. Bailey ... 127,547
Compound, lubricating, C. Reck ... 127,429
Corns, shield for, B. Brandreth ... 127,454
Corn sheller, N. S. Ketchum ... 127,610
Cord coverer, D. Weygandt ... 127,534
Cultivator, H. W. Bowen ... 127,453
Cultivator, N. Earlywine ... 127,469
Cultivator, W. C. Percy ... 127,508
Cultivator, G. Stiber ... 127,658
Curtain fixtures, D. G. Chase ... 127,565
Dental drill, J. J. Ross ... 127,58

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Dental purposes, compound for, V. Smith 127,656
Desk lid prop, H. R. Russell 127,519
Digger, potato, W. Peacock 127,640
Drawing board, C. G. Collins 127,573
Dredging machine, L. J. Gonyo 127,593
Drill, mode of operating rock, A. Blatchly 127,548
Dryer, clothes, A. J. Stowell 127,527
Earth closet, A. A. Jaqua 127,606
Earth closet, J. L. Young 127,540
Engine, direct acting steam, Benson and Avery 127,451
Engine, traction, O. A. Olmstead 127,507
Engine, slide valve for steam, O. M. Pike 127,642
Engine, rotary, G. R. Winkler 127,667
Eye glass, J. Cadman 127,459
Fabrics, manufacture of warp and paper pulp, L. M. Crane 127,463
Fastener, shutter, W. Altick 127,548
Felt rubber goods, machine for applying flock to, I. F. Williams 4,937
Fence, F. G. Brown 127,553
Fence post, composition, J. L. Boone 127,552
Fence, B. Williams 127,536
Flour bolt, S. Lewis 127,617
Fulling machine, C. P. Ladd 127,489
Funnel, S. W. O'Laughlen 127,506
Furnace, hot air, B. Gommenginger 127,476
Gas, making illuminating, J. L. Graves 127,411
Gas from retorts, apparatus for exhausting, J. Kidd, (reissue) 4,929
Glass blowers' tools, machine for holding, B. F. Turner 127,530
Glucose, manufacture of, W. H. Keyt 127,418
Governor, W. Clark 127,572
Governor, J. F. Haskins 127,602
Governor, C. P. Bowen, (reissue) 4,931
Grate, P. W. Pratt 127,514
Grate bar for furnace, A. Rawson 127,428
Grindstone axle, J. W. Ligon 127,492
Harness, safety, J. L. Arnold 127,403
Harness, mode of attaching clip to, R. L. B. Millliken 127,681
Harvester, sheaf dropper for, N. S. Ketchum 127,611
Harvester dropper, H. Nisen 127,636
Hat, leather, A. Bogardus 127,550
Hinge for shutters, H. L. Norton 127,425
Horse power, D. Woodbury 127,537
Horseshoe, A. Soles 127,657
Hydrant, extension fire, J. Fricker 127,478
Hydrant, G. W. Fisher 127,587
Inhaling and fumigating apparatus, E. C. Kirkwood 127,420
Irons, removable handle for sad, C. Graham 126,596
Iron, soldering, McMurray and Hollingsworth 127,499
Iron with tin, apparatus for coating sheet, W. O. Davies 127,580
Iron with zinc, process of coating, Grey and Lippincott 127,412
Knitting machine, stop motion for, T. F. Wynn 127,539
Lamp chimney, holder for sectional, C. T. Haughey 127,603
Lamp, D. Lubin 127,621
Lamp burner, reflecting, C. H. Tessy 127,660
Latch, door, W. H. Mott 127,505
Leggings, A. P. Smith 127,652
Lock, nut, Peterson and Coulter 127,509
Loom, circular, J. V. Reed, (reissue) 4,930
Manger, E. Carlin 127,563
Measuring device, liquid, Fisher and Bell 127,410
Metal, machine for twisting, T. Smith 127,436
Meter, liquid, I. Cook 127,575
Milk cooler, Jones and Faulkner 127,608
Mop, wringing, Holgate and Hart 127,416
Needles, machine for polishing the eye of, Dayton and Alldis 127,582
Needles, machine for polishing the eye of, R. Thompson 127,529
Nut, jam, J. M. Winslow 127,445
Ore crusher, J. Burns 127,561
Packages, tap for liquid, A. Warth 127,664
Packing, steam, A. O. Bourn 127,555
Packing, piston, J. R. McCormick 127,625
Pail, butter, S. D. King 127,612
Paper clip, E. A. Franklin 127,472
Pavement, J. Merlette, Sr. 127,628
Pavement, wood, J. I. Peyton 127,510
Pavement, wood, G. F. Ziegler 127,669
Peat, process of treating, Hawley and Morgan 127,415
Pencil, lead, T. H. Müller 127,633
Petroleum and other hydrocarbon oils, treating, J. Young 127,447
Petroleum, product from, R. A. Chesebrough 127,568
Photographer's posing chair, I. O. Swett 127,439
Pipe elbow, sheet metal, F. Dieckmann 127,583
Pipe, manufacture of cement, A. P. Stephens 127,498
Plane stock, S. M. Adams, ... 127,541
Planter, corn, Selby and Bowman 127,648
Plasters, machine for spreading, W. N. Reed 127,517
Plow, E. A. Blodgett 127,549
Plow, H. Gillette 127,475
Plow, M. W. Lane 127,613
Plow, gang, D. A. Manuel 127,495
Plow, G. Shelton 127,650
Plow, sulky, Worrell and Rynerson 127,538
Plow, wheel, W. G. Crossley, (reissue) 4,928
Powder or dentifrice, tooth, W. H. Farnham 127,408
Preserving meats, etc., J. F. Meiners 127,627
Press, T. G. Brooke 127,557
Press, provision, F. Potter 127,427
Press, hay and cotton, W. H. Whetstone 127,666
Pump, chain, W. Cooper 127,576
Pump piston, C. B. Gill 127,594
Pump piston, A. Griffin 127,480
Pump, sand, J. Smith 127,655
Pump and fountain, J. J. Sink 127,651
Rail, guard, W. Wharton 127,665
Railroad tie, composition, J. L. Boone 127,553
Railway rail splice, D. J. Clark 127,570
Railway tie, D. B. Day 127,581
Railway rail chair, M. G. Freeman 127,588
Rake, hay, J. C. Stoddard 127,659
Refrigerator, L. Giebrich 127,593
Rein holder, C. B. Neff 127,634
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Vehicle, chafe iron for wheeled, E. P. Roche 127,645
Vehicles, support for the tongue of, H. Sprague 127,522
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Water supply and waste arrangements, washstand, H. J. Ruthrauff 127,433
Water wheel, W. Forward 127,471
Water wheel, J. P. Lamoree 127,490
Weather strip, J. Haessel 127,599
Wheels to axles, device for attaching, D. A. Johnson 127,607
Wind wheel, H. J. Campbell 127,460
Wood, process and apparatus for treating, I. Hayford 127,482
Yoke, neck, J. Ives 127,605

DESIGNS PATENTED.

5,883.—CARPET.—M. Blatchford, Halifax, England.
5,884 to 5,890.—CARPETS.—A. Cowell, Kidderminster, England.
5,891.—CARPET.—J. Humphries, Kidderminster, England.
5,892.—CLOCK CASE.—Nicholas Müller, New York city.
5,853 to 5,896.—CARPETS.—D. Paton, Halifax, England.
5,897.—CARPET.—F. J. Peirce, Boston, Mass.
5,898 and 5,899.—CARPETS.—E. Poole, Halifax, England.
5,900.—GLASSWARE.—J. S. and T. B. Atterbury, Birmingham, Pa.
5,901.—HEATING STOVE.—C. H. Castle, Quincy, Ill.
5,902 to 5,904.—CARPETS.—J. Humphries, Kidderminster, England.
5,905.—CARPET.—A. McCallum, Halifax, England.
5,906 and 5,907.—FLOOR CLOTHS.—C. T. and V. E. Meyer, Lyon's Farms, N. J.
5,908 and 5,909.—CARPETS.—E. Poole, Halifax, England.
5,910.—CARPET.—E. J. Ney, New York city.

TRADE MARKS REGISTERED.

843.—SCYTHES.—Beardsley Scythe Company, West Winsted, Conn.
844.—OVERSHOES.—E. F. Bickford, Malden, Mass.
845 and 846.—BITTERS.—H. S. Flint & Co., Providence, R. I.
847.—LEAD.—Forest River Lead Company, Salem, Mass.
848.—TAMARIND BEER.—W. H. Goss, Boston, Mass.
849 and 850.—EDGE TOOLS, ETC.—The Collins Company, Collinsville, Conn.
851.—STATIONERY.—Mercantile Loan and Warehouse Co., New York city.

APPLICATIONS FOR EXTENSIONS.

Applications have been duly filed, and are now pending, for the extension of the following Letters Patent. Hearings upon the respective applications are appointed for the days hereinafter mentioned:

21,240.—LATHES FOR TURNING BEADED WORK.—F. Baldwin. August 7, 1872.
21,272.—FARE BOX FOR OMNIBUSES, ETC.—J. B. Slawson. August 14, 1872.
21,464.—MANUFACTURE OF BRUSHES.—Stephen Barnes. August 21, 1872.
21,574.—PREVENTING NUTS FROM UNSCREWING.—Samuel Noblet. Sept. 4, 1872.
21,749.—CROSS SEAMING SHEET METAL.—Lucian Fay. Sept. 25, 1872.
21,268.—HORSE RAKES.—M. Morgan. August 7, 1872.
21,306.—HILL SIDE PLOW.—H. S. Akins. August 14, 1872.
21,324.—SUN SHADE.—A. G. Davis. August 14, 1872.
21,367.—CARRIER OF THRASHING MACHINE.—F. W. Robinson. August 14, 1872.
21,391.—PROP OF CARRIAGE BOW.—D. B. Wright, L. Sawyer. August 14, 1872.
21,540.—APPARATUS FOR HARVESTERS.—A. Sherwood. August 28, 1872.

EXTENSIONS GRANTED.

20,314.—VALVE COCK.—S. Adams.
20,337.—LEVELING DEVICE.—H. Disston, T. L. Morss.
20,353.—ELECTROTYPE PLATES.—S. P. Knight.
20,356.—PROTRACTOR.—J. Lyman.
20,364.—CLOTHES PIN.—D. Pierce.
20,385.—POWER AND HAND DRILL.—H. Woodman.

EXTENSION REFUSED.

20,411.—RAKING ATTACHMENT TO HARVESTER.—D. O. De Wolf.

DISCLAIMER.

LOOMS AND FABRICS.—W. Smith, New York city.

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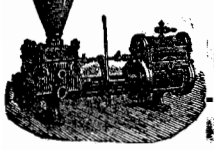

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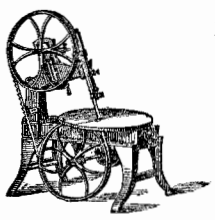

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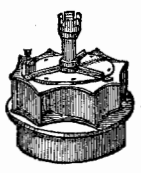

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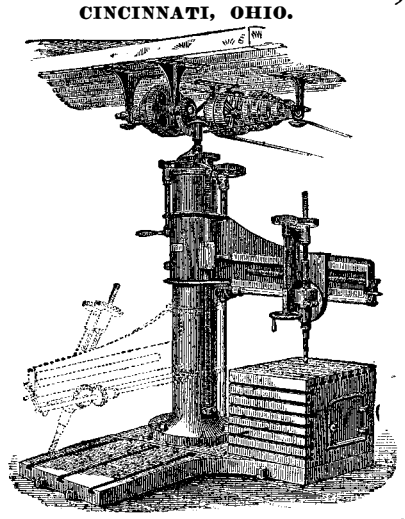

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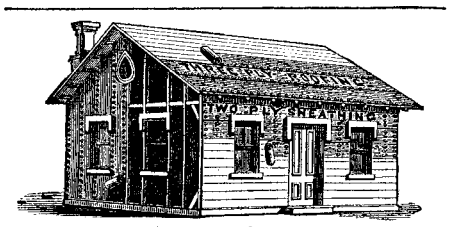

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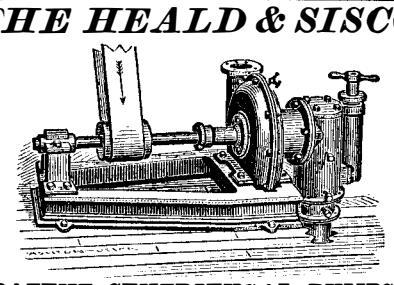

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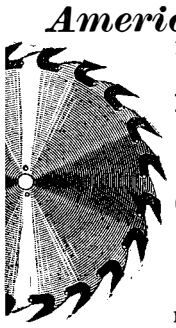

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